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Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Change of Meeting Date, Western Gas Association.

WESTERN GAS ASSOCIATION,
OFFICE OF SECRETARY, NEW ALBANY, IND.,
February 23, 1904.

To the Members of the Western Gas Association: By an almost unanimous vote of the members of the Western Gas Association, the date of the meeting has been changed, from the third Wednesday in May to June 14, 15, 16 and 17. Yours truly, J. W. DUNBAR, Secy.

[OFFICIAL NOTICE.]

Twentieth Annual Meeting, Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF THE SECRETARY, DELAWARE, O.,
February 25, 1904.

The Twentieth Annual Meeting of the Ohio Gas Light Association will be held at Cleveland, O., March 16th, 17th and 18th.

The President, Mr. John D. McIlhenny, of Philadelphia, Pa., will call the meeting to order on Wednesday, March 16th at 9:30 A.M., in Assembly Hall at the Hollenden Hotel, the headquarters.

The following will be presented at the meeting:

"Question-Box," edited by Mr. Henry L. Doherty, New York City.

"Progress Department," edited by Mr. Irvin Butterworth, Detroit, Mich.

"Novelty Advertising Department," edited by Mr. B. W. Perkins, South Bend, Ind.

"Wrinkle Department," edited by Mr. E. E. Eysenbach, St. Paul, Minn.

Reports of Committees:

"Uniformity of Gas Meters," Messrs. Chas. S. Ritter, Detroit, Mich.; R. Shacklette, Adrian, Mich.; Donald McDonald, Albany, N. Y.

"Standard Sizes for Coke," Mr. C. W. Andrews, Duluth, Minn.

"Uniform System of Mapping Mains," Mr. W. H. Barthold, Grand Rapids, Mich.

"Standard Methods of Testing Fuel Gas Appliances," Messrs. Henry L. Doherty, New York City; F. W. Stone, Ashtabula, O.; John Franklin, Cincinnati, O.

"Flow of Gas in Pipes," Messrs. H. A. Carpenter, Pittsburg, Pa.; J. D. Shattuck, Darby, Pa.; J. O. Johnston, Columbus, O.

"Bureau of Forms and Records," Mr. F. W. Stone, Ashtabula, O.

Papers:

"The Construction and Operation of Recuperative Benches; No. 2," by Mr. W. A. Baehr, St. Louis, Mo.

"Why English Gas Outputs are Large, with Lessons to be Drawn in the United States," by Mr. J. T. Westcott, London, Eng.

"Economy in Oxide Purification," by Mr. H. L. Rice, Norfolk, Va.

"High Pressure Gas Street Lamps," by Mr. J. J. Knight, Kalamazoo, Mich.

"Care of Station Meters," by Mr. Henry R. Cartwright, Philadelphia, Pa.

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Short Topics:

"District Collection of Gas Bills," by Mr. F. W. Frueauff, Denver, Col.

"Burning Coke Breeze on Hollow Grates," by Mr. C. H. Williams, Madison, Wis.

"Burning Coke Breeze with Under-Feed Stokers," by Mr. M. E. Malone, Denver, Col.

"Water Gas Tar Used in Generators for Enrichment," by Mr. Henry I. Lea, Fort Wayne, Ind.

"Industrial Fuel Gas Appliances," by Mr. J. Chas. Andrews, Denver, Col.

Competitive Papers:

"Best Arrangement for Recovering and Utilizing the Waste Heat from Gas Benches." Premium offered by the President, Mr. John D. McIlhenny.

An opportunity will be given any of the speakers at the meeting to correct their remarks before leaving Cleveland, but not after, as all the reports will be turned over to the printer immediately after the meeting.

The Hollenden is conducted on the European plan, and the following rates have been secured for the meeting: $1.50, $2, $2.50, $3, $3 50, $4 per day for each person, each room to be occupied by two people or paid for accordingly.

The Hollenden hopes to entertain all of the Association and will put forth every effort to make the members comfortable. The most satisfactory quarters are always obtained by writing in advance to the hotel people.

Through the courtesy of the lines constituting the Central, Trunk Line, Southeastern and Western Passenger Associations and the Southwestern Excursion Bureau, persons attending the meeting will be granted special rates for transportation under the certificate plan, viz., full fare going and one-third fare returning.

The territory covered by these Associations includes all States East of the Missouri and Mississippi rivers, except the New England States; and Nebraska, Kansas, Colorado and Missouri, west of the Missouri river. Each person desiring the excursion fare must purchase a first-class ticket to the place of meeting, for which he will pay the regular fare, and upon request the ticket agent will issue a printed certificate of purchase. Tickets for the return journey will be sold by the ticket agent at the place of meeting at one-third the first-class fare, only to those holding certificates signed by the ticket agent at point where through ticket to place of meeting was purchased, countersigned by the Secretary of the Association, vised by the special agent of the Passenger Associations. Apply for ticket and certificate at least 30 minutes before train time. Be sure to hand the Secretary your certificate, ascompanied by 25 cents, as soon as you reach headquarters. All persons attending the meeting, whether members or not, are entitled to the reduced rates. It was only through the most strenuous efforts that the above concession was secured from the Passenger Associations, and *you are most earnestly requested to obtain a railroad certificate when buying your ticket for Cleveland.*

The Secretary will furnish with pleasure application blanks for membership and any further information which may be desired relative to the meeting.

T. C. JONES, Secretary.

[OFFICIAL NOTICE.]

Premiums Offered, Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF SECRETARY, DELAWARE, O.,
January 4, 1904.

It affords me very great pleasure to announce to the gas fraternity that, in connection with the Twentieth Annual Meeting of the Ohio Gas Light Association, which is to be held in Cleveland, March 16th, 17th and 18th, 1904, Mr. John D. McIlhenny, President of the Association, will offer the following premium for the best paper on "The Best Arrangement for Recovering and Utilizing the Waste Heat from Gas Benches."

Abady's "Gas Analyst's Manual."
Byrne's "Highway Construction."
Carpenter's "Heating and Ventilating of Buildings."
Carhart's "High School Physics."
Crooker's "Electric Lighting," 2 Vols. (1, Station; 2, Distribution).
Crafton, "Handbook of Practical Gasfitting."
Groves and Thorpe's "Gas Lighting."
Hughes and Richard's "Gas Works."
Johnson's "Engineering Contracts and Specifications."
Kent's "Mechanical Engineers' Pocketbook."
Patton's "Treatise on Foundations."
"Self-Instruction in Gas Manufacture."
Wagner's "Chemical Technology."
Newbigging's "Handbook for Gas Engineers."

Competition is open to all. A committee will be appointed and announced later to pass on the contributions and the decision of the committee will be made known at the meeting. Those desiring to enter this competition should have their paper in the hands of the Secretary not later than March 1st, 1904.

T. C. JONES, Secretary.

[OFFICIAL NOTICE.]

Novelty Advertising Department, Ohio Gas Light Association.—No. I.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF SECRETARY, DELAWARE, O.,
December 12, 1903.

The Editor of the Novelty Advertising Department, Mr. B. W. Perkins, of South Bend, Ind., desires to announce that his department is now open for contributions to be presented at the Twentieth Annual Meeting, which will be held in Cleveland, March 16th, 17th and 18th.

This department is one of the most attractive features of the convention. Its success, however, depends largely upon the active co-operation of the members. It is, therefore, earnestly hoped that the fraternity will not be backward in sending advertising schemes to Mr. Perkins.

T. C. JONES, Secretary.

[OFFICIAL NOTICE.]

Novelty Advertising Department, Ohio Gas Light Association.—No. II.

OFFICE OF THE EDITOR,
SOUTH BEND, IND., December 30, 1903.

The Executive Committee of the Ohio Gas Light Association has added to the Novelty Advertising Department a "New Business Methods Department," which, with the former, will combine any and all methods for furthering the business of gas companies. This will include any scheme or method that has been, or is being, used to further the sales or use of gas, coke, tar, gas fixtures, fittings, ranges, heaters, etc.; in short, all residuals and gas consuming appliances, whether for fuel or lighting purposes.

Contributions are requested from all, whether they are members of the Ohio Gas Light Association or not, as the proceedings are published and the use of any method mentioned is for the use of the fraternity at large. Contributions are requested to be sent as early as possible, as their arrangement and printing require considerable time.

Yours truly, B. W. PERKINS, Editor.

BRIEFLY TOLD.

NOTES.—

MR. THOMAS EVANS, who for quite 30 years has been a satisfactory and efficient employee of the Hartford (Conn.) City Gas Light Company, handed in his resignation as Secretary at a special meeting of the Directors, held February 27th. The resignation was accepted.

MR. JESSE JOSEPH, well known a few years ago to the gas fraternity, through his Presidency of the Montreal (Can.) Gas Company, died at his home on Sherbrooke street, Montreal, the morning of February 24th. He was born in Berthier, Canada, May 28, 1817, and in 1832 came to Montreal, where he engaged in mercantile business, and subsequently amassed a fortune. In the early seventies he was a marked power in the business fortunes of Montreal—in fact, throughout Canada. His connection with the Montreal Gas Company dates from 1864, and he succeeded the late Mr. Thos. Henry as its President in 1887. This position he held for several years. He was a bachelor.

MR. CHARLES F. MAYER, formerly President of the Despard Gas Coal Company, and subsequently President of the Consolidated Gas Company, of Baltimore, Md., died the afternoon of February 25th, at his home in Baltimore,

THE Board of Gas and Electric Light Commissioners has authorized the Beverly Gas and Electric Light Company to issue 520 shares of additional stock, at $140 per share.

[Official Report—Revised by the Secretary.—Continued from page 325.]

THIRTY-FOURTH ANNUAL MEETING OF THE NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held in Young's Hotel, Boston, Mass., Feb. 18th and 19th, 1904.

First Day, Feb. 18—Morning Session.

The President called for the

Reports of the Secretary, Treasurer and Librarian,

which were read by Secretary Gifford as follows:

As Treasurer, Mr. Gifford reported that the receipts for the year (the accounts balance to Jan. 1, 1904) amounted to $1,465.68, that the expenditures were $1,361.49, and that the balance was $104.19. The report bore the certification of Messrs. B. J. Allen and T. H. Hintze that the same was correct.

As Secretary, Mr. Gifford said:

At the last meeting there were added to the rolls 13 active members and 14 associates; there was one transfer from active to honorary membership, and one transfer from associate to active membership. During the year 5 deaths were reported, and 14 were dropped for nonpayment of dues. There are now on the rolls 8 honorary, 146 active and 67 associate members, a total of 221. During the year 300 copies of the proceedings of the Association for the years 1902 and 1903 were printed and a copy sent to each of the members. Another volume to contain the proceedings for 1897–'98–'99 is now in print and will be issued shortly.

As Librarian Mr. Gifford presented the following:

Gentlemen: In accordance with the vote of the Association at the last annual meeting your Directors have arranged with the Boston Society of Civil Engineers for the joint use of their library and the storage of our books with theirs. The Association now has its library of over 100 volumes located in Room 715, Tremont Temple. The card index catalogue of current gas literature by the Western Gas Association is a valuable addition lately received, and it is among those now ready for reference. In another recent contribution are the last 19 volumes of the American Gas Light Journal, which are now being bound. Anyone having numbers of the Journal previous to 1884 which they wish to dispose of will please communicate with the librarian. Arrangements have been made to exchange publications with the various Gas Associations, the American Society of Civil Engineers, and some other engineering societies.

On motion of Captain White the reports were received and ordered filed.

The following members responded to the

ROLL CALL.

Honorary Members.

Capt. W. H. White, New York City. W. H. Bradley, New York City.

Active Members.

Addicks, W. R., New York City.
Africa, W. G., Manchester, N. H.
Alden, G. A., Watertown, Mass.
Allen, B. J., Allston, Mass.
Allyn, H. A., E. Cambridge, Mass.
Anderson, W., Lynn, Mass.
Barnes, W. M., Providence, R. I.
Barnum, D. D., Worcester, Mass.
Bartlett, L., Cottage City, Mass.
Bill, B. P., Montpelier, Vt.
Burritt, D. T., Portsmouth, N. H.
Cathels, E., Providence, R. I.
Campbell, A. J., Norwich, Conn.
Cheney, H. N., Allston. Mass.
Coffin, J. A., Gloucester, Mass.
Coggeshall, H.F., Fitchburg, Mass.
Cooper, A. F., Exeter, N. H.
Coyle, P., Charlestown, Mass.
Crafts, H. C., Northampton, Mass.
Dickens, J., Newburyport, Mass.
Earle, A. G., Bristol, R. I.
Eccles, A. D., Ware, Mass.
Ellis, J. W., Providence, R. I.
Erhard, T., East Cambridge, Mass.
Fowler. S. J., Charlestown, Mass.
Frost, C. T., Plymouth, Mass.
Gifford, C. H., New Bedford, Mass.
Gifford, N. W., East Boston, Mass.
Gould, J. A., Boston, Mass.
Goulding, N. O., Natick, Mass.
Graf, C. H., New York City.
Hassett, E. J., Beverly, Mass.
Hawken, T., Rockland, Me.
Hintze, T. H., Lowell, Mass.
Humphreys, C.J.R., Lawrence, Mass.
Humphreys, J. J., Jr., Coney Island, N. Y.
Jenks, Z. M., Woonsocket, R. I.
Jennings, F. W., So. Framingham, Mass.
Kelly, H. H., Waltham, Mass.
Learned, E. C., New Britain, Conn.
Learned, W. A., Newton, Mass.
Learned, C. A., Meriden, Conn.
Leonard, C. F., Fall River, Mass.
Mace, F. W., Lynn, Mass.
Manchester, G. L., Easthampton, Mass.
McKay, W. E., Boston, Mass.
Morrison, H. K., Concord, N. H.
Norton, H. A., Boston, Mass.
Norton, W. F., Nashua, N. H.
Norton, P. T., Nashua, N. H.
Nute, J. E., Fall River, Mass.
Nutting, C. H., Chicopee, Mass.
Nutter, J. J., Milford, Mass.
Prichard, C. F., Lynn, Mass.
Philbrick, J. E., Brockton, Mass.
Polk, R. W., Rutland, Vt.
Quinn, A. K., Newport, R. I.
Richardson, F.S., N. Adams, Mass.
Sargent, F. S., Lawrence, Mass.
Shelton, F. H., Philadelphia, Pa.
Slater, A. B., Jr., Fort Wayne, Ind.
Snow, W. H., Holyoke, Mass.
Spaulding, C. F., Waltham, Mass.
Spear, J. Q. A., Dorchester, Mass.
Stearns, W. M., Waltham, Mass.
Stevens, C S., Haverhill, Mass.
Stone, A. F., Chelsea, Mass.
Tait, F. M., New London, Conn.
Thayer, W. F., Westfield, Mass.
Todd, J. R., Lynn, Mass.
Walker, E. M., Dedham, Mass.
Walker, W. L., Fitchburg, Mass.
Willard, A. R., Greenfield, Mass.
Wood, W. A., Boston, Mass.
Woodward, R., Pittsfield, Mass.
Yorke, E. H., Portland, Me.

Associate Members.

Baker, S. E., Fall River, Mass.
Barnes, A. M., Cambridge, Mass.
Baldwin, C. H., Boston, Mass.
Browne, A. P., Boston, Mass.
Campbell, W. F., Boston, Mass.
Coburn, C. M., Chelsea, Mass.
Dart, E. M., Providence, R. I.
Davis, F. J., Waltham, Mass.
Dickel, W. L., Boston, Mass.
Farrington, A. N., Boston, Mass.
Hall, A. S., Boston, Mass.
Hinman, C.W., Charlestown, Mass.
Holmes, R. E., Winsted, Conn.
Kerr, J. B., Dedham, Mass.
Norton, A. E., Boston, Mass.
Piser, T. H., Boston, Mass.
Russell, D. D., Boston, Mass.
Scranton, G. H., Derby, Conn.
Stafford, W. R., Newton, Mass.
Thomas, F. W., Boston, Mass.
Wilder, C. C., Springfield, Mass.

Appointment of Committees on Obituary Resolutions.

The President appointed the following Committees on Obituary Resolutions:

W. R. Plunkett—Messrs. Ralph Woodward and Col. F. S. Richardson.
H. M. Lane—Messrs. H. F. Coggeshall and F. W. Thomas.
W. A. Stedman—Messrs. A. K. Quinn and H. A. Allyn.
Henry B. Leach—Messrs. W. A. Wood and A. B. Slater, Jr.
Eugene Vanderpool—Capt. W. H. White and Mr. William H. Bradley.

A Telegram and Some Correspondence.

The Secretary—A telegram received, dated Milwaukee, Wis., Feb. 17, reads:

To N. W. Gifford, Secretary, New England Association of Gas Engineers, Young's Hotel, Boston: "The Wisconsin Association, the youngest Gas Association in this country, extends to its parent, the New England Association, best wishes for a successful meeting.—H. H. Hyde, Secretary."

I have also a large list of acceptances and some regrets from gentlemen to whom invitations have been sent. I regret that the letters were left in my room, so perhaps you will kindly excuse the reading of them.

On motion of Mr. Shelton the Secretary was instructed to send a suitable despatch in recognition of the message from the Wisconsin Gas Association.

A Dip into the Question Box.

The President—The first question in the box relates to the prevention of fire in gas coal piles. In answer to that question, and in order to open it up for a more general discussion, there was sent to the Secretary the finding thereon of the Home Insurance Company, of New York, which is as follows:

Bituminous Coal Fires.—In view of the frequency of fires in deposits of bituminous or soft coal, so called, which are perhaps justly ascribed to spontaneous ignition, we are desirous of having made inspections and investigations evincing more care and discrimination than have heretofore been the practice where liability has been assumed or is to be assumed under policies of this Company, and we, therefore, present for your consideration the following remarks in relation to the causes of such fires, and some suggestions for means or methods whereby it is to be hoped that the frequent occurrence of such fires may be minimized if not eliminated in practice.

The liability to spontaneous ignition and combustion appears to be most marked in free burning, or so called "high steaming" coals, which class includes "gas coal," and usually contains a large per centage of volatile constituents in combination with a modicum of oxygen, and in this class the tendency to spontaneously heat is particularly aggravated when impurities such as lignites or sulphur in any of its forms, but especially when in the nature of iron pyrites (sulphuret of iron), are present in the mass.

Dirty or unsorted coal, known to the trade as "mine run" (*i.e.*, as it comes from the mines, without being sorted or graded) presents the most decided tendency to heat, regardless of any specific trade name or grading as to quality when sorted, and the comminution of such coal (and indeed, of any coal of a bituminous nature, accentuates the probability of spontaneous heating, and the extent of comminution in a given quantity of any of these coals which should result from the ordinary methods due to mining, shipping and handling, will be found to vary with each class, some of them being prone to disintegrate into fine portions under the action of the atmosphere, while others only reach a condition of

fineness through the abrasions due to handling; but in either case when the lot is stowed away the finer particles are prone to sift through the mass and form the bottom of the pile, where they become subject to the effect of pressure and consequent heating.

An entirely satisfactory explanation of the phenomenon of spontaneous ignition of bituminous coal has never been formulated, but the best authorities of the present day appear to be agreed in the conclusion that such heating is ascribable to chemical change in the substance resulting from the absorption of oxygen, and that this absorptive quality of the carbon constituents of the coal increases with any rise in temperature of the mass however produced, whether through chemical action due to slow oxidation, or as the result of the mechanical force exerted through the pressure of the mass, due to height and volume and that the conditions thus arising are considerably stimulated in action by the presence of pyrites or moisture.

Specific instances of spontaneous combustion lead us to the conclusion that the presence of moisture, due to the inclusion of unmelted snow or ice in the mass of coal when stowed, serves to markedly accelerate chemical combinations and consequent heating, though it is unquestionably true that moisture due to other means also promotes self ignition in the mass when stowed away under pressure.

While it is generally admitted that the presence of sulphur, as of pyrites, in the mass of coal tends to promote and stimulate chemical changes productive of heat, none of the accredited investigators has as yet formulated an opinion definitely fixing the limits of hazard due to the presence of this material, but it has been assumed by some authorities that anything in excess of 2½ per cent. of such matter is indicative of danger in respect to heating. As all operators are supposed to analyze the mine output, in order to properly grade it in relation to the presence of sulphur and other deleterious matters, it ought not to prove a difficult task to learn, approximately at least, just what percentage of sulphur is liable to show in any special grade of coal under investigation, and such information should be accorded.

Practical experience in coal fires ascribable to spontaneous combustion seems to indicate a native, but varying propensity to "heat" in the several classes of bituminous coal in general use in the Eastern and Middle States in about the following order of susceptibility:

Nova Scotia, or "Dominion"; Pocahontas (West Virginia); New River (West Virginia); Clearfield (Pennsylvania); "Berwind-White" (Pennsylvania); Pittsburg (Pennsylvania); Georges Creek (Maryland).

The latter (Georges Creek) is credited with being the equal of any of the other free burning "high steaming" bituminous coals, and so far as specific records and information may prove a guide, there has never been a fire properly ascribable to spontaneous combustion in this grade of coal, but unfortunately the product of these mines appears to be limited in possible volume.

The experience gained in the handling of coal used and stored by steam railroads for use, as undertaken by us some years ago, seems to have demonstrated the following points as tending to minimize if not to entirely prevent the occurrence of serious self ignition fires in this very unsatisfactory subject for insurance, viz.:

Accumulations of bituminous coal in any one pile, heap, pocket or bunker should in no case exceed 1,500 tons in volume.

Where more than one accumulation of such or less volume is necessary at contiguous localities, there should be established a clear space of not less than 5 feet between the piles, and this space should be maintained absolutely free for complete ventilation and dispersion of occluded gases from the mass.

No accumulation of coal, of 1,500 or less tons in volume, should be piled in excess of 12 feet in height when "trimmed off" or "squared," but where such accumulation is delivered from dump-cars on trestle over 12 feet in height, the extreme height of the pile, formed by the natural run of the coal as dumped from the cars, should not exceed 15 feet to the apex of the triangle of coal produced by this method of deposit.

Where coal is stowed under shelter or inside of structures most perfect ventilation should be secured, to facilitate the escape of gas by the circulation of the atmosphere.

Wherever it is possible to do so all wet coal, and especially that wetted by snow and ice, should be disposed of for immediate use without first being stowed; if, however, its stowage is unavoidable it should form the top of the pile, and be spread out as thinly as may be practicable to expedite drying by evaporation.

All accumulations of bituminous coal, whether large or small, should be "rod tested" with frequency and regularity, in order to discover any tendency toward dangerous heating; the degree of such danger line should be set at about 160° F. When this temperature has been reached the exact locality of increasing heat may be designated by the use of iron piping inserted into different sections of the mass, into which piping a self registering thermometer should be lowered and allowed to remain for sufficient time to record the intensity of heating, thereby enabling prompt measures of relief to be undertaken by those in interest, without waste of time and unnecessary handling and shifting of material to locate trouble.

While it is not at present probable that shippers of bituminous coal make it a practice to advise consignees of the percentage of sulphur or its compounds which are known to exist in shipments, it is very desirable that such information should be had, in view of the apparent consensus of expert opinion that the presence of this deleterious material tends to an increase of fire hazard, and this point should be forcefully presented to the insured in each instance where we are under obligation for protection against fire.

In conclusion it may be said, that in order to permit the home office to reach reliable judgment, it is essential that each of the points above designated should appear in the report of any risk of this class which comes under your inspection or criticism, and it is hoped that, by an adherence to the essentials here laid down, there may in the future be some hope of profit in the assumption of liability on bituminous coal, which condition does not now appear to prevail.

F. M. Griswold, G. I.

Discussion.

The President—Some of the members have had recent experiences that will further amplify this subject. Mr. Hintze, do you wish to say anything with respect to this matter?

Mr. Hintze—The question is, what precautions are necessary to prevent fires in gas coal, and as information is what I am after, I would like to get it from other members who have had experience in this line.

Mr. Hawken—I might say I had considerable experience with soft coal this past summer. In first starting the pile, over a considerable space I put a layer of buckwheat coal, about 6 feet thick, then piled the bituminous coal on top. In this pile I had no trouble, but in the pile that I placed on the ground there was no end of trouble. I laid 3½ inch boiler tubes horizontally through the pile, and at each post of the trestle, but none of those in trying to prevent the fire had any effect whatever. I found that it would take fire where the coal was not over 8 feet high, and also in places that were not over 5 feet high. The only method I followed for keeping fire out was putting the hose into the boiler tubes and thoroughly saturating the pile. When fire showed up I put water into it.

Mr. Norcross—I had a pile of coal 15 or 16 feet high get on fire. I reduced the height, spread it out to 8 or 9 feet in depth and had no more trouble. The coal was stored a long time afterwards in the open, subject to rain and moisture.

The President—It would be well if we could get some general idea of the limit of depth and of mass found advisable in practice. In one case there has been a fire with a depth of but 8 feet, and there have been many cases where the depth has been more than that, and no trouble has been experienced, even with a considerable percentage of sulphur. Will members give their individual experience as to storing coal in respect to depth and mass?

Mr. Allyn—When I took charge of the Cambridge works one of our Directors was largely interested in a Provincial Coal Company, with the result that the Company has been in the habit of buying something over half of its supply of Province coal. The Company had rather a bitter experience to start with, before the shed was fairly completed. As the winter was coming on they rushed the coal in mixing the Province with the Pennsylvania. The first they knew the coal was on fire from one end of the shed to the other, so that about 4,000 tons had to be shoveled over and carted out of the shed before we could extinguish the fire. The trestle in the middle of the shed was supported on 12-inch timbers, I think about 10 feet apart, and on each of those posts a ¾-inch pipe was fastened, extending from the stage overhead to within about 6 inches of the ground below. In this thermometers were put, and the record of the temperatures was taken. Reference has been made to not putting a mass of over 1,500 tons, I think it was, in one location. It seems to me that statement is rather indefinite, because you might spread out your 1,500 tons 4 feet deep, and probably would have no trouble. We found that about the safe limit was 8 feet in depth. I think we never had a fire where the coal was at that depth, but at greater depths we were pretty sure to get the coal on fire. Another argument in regard to the mass of the coal. The last fire we had occurred near the corner of the shed, about 10 feet distant from each angle, but the coal farther back showed no indication of any heat; in fact we were fooled in the matter. I took the temperature myself

the morning before we discovered the fire and found it normal at 8 inches above the floor level; but when we discovered this fire it was in the coal about 4 feet from the ground, so that our thermometer had been below that level and did not show any heating in the coal. The best remedy that I know of to prevent the coal from taking fire is not to buy the coal that takes fire. (Laughter.)

Mr. Coggeshall—I wanted to ask the first and second speakers what kind of coal they used when it took fire? Nova Scotia coal, known as Glace Bay?

Mr. Hawken—The coal that we had the trouble with on the Rockland, Thomaston and Camden Street Railway was named "Pilgrim."

Mr. Norcross—The name of the coal that troubled us was "Columbus." It was bought of New Haven people, and was a run of mine Pittsburg coal.

Mr. Coggeshall—In 1858 I was using Province coal. I think it was the Glace Bay variety, and I had my shed just as full as it could be piled—about 12 feet. Probably two months after that, when I was down at the works, I thought I smelled gas. I said, "I want you to keep watch of that and let me know at once if there is any fire." That was before we had electric service at all. I stopped at the office of the chief engineer of the fire department and told him if he heard the whistle blow he might know where the fire was. I hadn't more than got down there the second time before out she came. It took all day long, with the engines pumping water on to that coal, before we got the fire queuched. In fact, the water was cool as it ran out. Three days afterwards that coal took fire again, and we quenched it for the last time. I have used Pennsylvania coal from, say, about 1865 up, and never have had indication of any fire, although the pile was as deep as it was in the other case. When we used that coal we found that about 4 feet from the bottom it was all coke; no value at all for making gas. One of our Directors, who was managing paper mills both in Fitchburg and Leominster last season, three times had a fire in his heap of coal, which was the same coal that I am using for steam, called the "Eclipse"—it is a Clearfield coal—but he had it piled about 25 feet. On these occasions he had fire in it.

Mr. Allyn—One hint I would like to give to people who have never enjoyed the experience of having coal on fire is, don't get excited and go to squirting water on to the coal. That is entirely unnecessary. Locate the fire as near as you can, then dig for it. As soon as the air comes to it your fire will go out without any further trouble; but if you put the water on you are only adding to the mischief. In a short time the coal that you have wet down will be pretty sure to heat and get on fire again.

Mr. Coggeshall—In my case you could not dig it out.

Mr. Prichard—I would like to qualify that remark a little, because I differ with him in some respects. We have been piling coal in the shed for the last twenty years something like 25 feet high, and have had as much as 10,000 tons of coal in the pile at once. We have had but one fire. It did not catch at the bottom, but at a point about 8 feet down, showing that the pressure was not altogether the cause of the fire. It was in a closed shed. We endeavored to dig it, we endeavored to put it out by chemicals, and we fought it in various ways for nearly a week, till one night the firemen came to me and said, "Unless you allow us to put water on that fire inside of an hour we cannot stay in the shed." The only way we could take out the coal was to put water on it and hold the fire back until we got a chance to dig it out. So I say that you cannot always follow the advice of Mr. Allyn, although it is preferable if you can; but you can keep your fire under control with water if you are obliged to.

The President—In connection with this subject the Secretary will please read a letter recently received:

WESTERN GAS ASSOCIATION, OFFICE OF PRESIDENT,
1004 PENNSYLVANIA BDG., 15TH AND CHESTNUT STREETS,
PHILADELPHIA, PA., Feb. 8th, 1904.

MR. N. W. GIFFORD, Secretary New England Gas Association—Dear Sir: I am taking the liberty of inclosing two letters that I will be glad to have you read before your Association when it meets. We feel that both the "Index" and the "Gas Exhibit" work are subjects that all fellow gas men would be glad to know about.

The "Index" I am sending by express to the Association's headquarters, and after it is seen at its meeting, the Western will ask you to accept it as a copy for your Association at large, with the compliments of the Western Gas Association.

Yours truly, F. H. SHELTON, President.

The President—In the letter transmitting this communication the Western Association, through its President Mr. Shelton, asks the New England Association to accept this set of the "Index" as a copy for the Association at large, with the compliments of the Western Gas Association. When it looked as though there would be no other response to that particular question, I looked up this matter of the spontaneous ignition of coal, and I find these cards: Subject: "Combustibility of Coal, Spontaneous;" author, Lang; reference, AMERICAN GAS LIGHT JOURNAL, Volume 71; 12-18-99; length, 1½ pages. Another card: Subject: "Spontaneous Ignition of Coal;" author, Report of the Naval Board; reference, AMERICAN GAS LIGHT JOURNAL, Volume 72; 1-1-00; length 4 pages. The length refers to the number of pages. These reports are in their way thorough and complete, radical. That is only one instance of the utility of this index. Of course, it will be very helpful, if we get no other answers to these questions during the proceedings. Is there any other gentleman who will contribute his experience on this subject of coal?

Mr. Addicks—I think Mr. Shelton was thanked for this contribution last year in advance, but I think, having received it and realizing the value of it, the Western Association is certainly entitled to our thanks again. I will say that I have one of these card catalogues, and within 24 hours after it arrived I was enabled to get valuable information therefrom. Mr. President, I move a vote of thanks to the Western Gas Association.

The motion was adopted unanimously.

AN OFFICIAL COMMUNICATION FROM THE WESTERN GAS ASSOCIATION.

The President—The Secretary has a communication from the Western Gas Association, to which I will ask you to listen.

WESTERN GAS ASSOCIATION, OFFICE OF PRESIDENT,
1004 PENNSYLVANIA BDG., 15TH AND CHESTNUT STREETS,
PHILADELPHIA, PA., Feb. 8th, 1904.

To the President and Members of the New England Association of Gas Engineers: You are no doubt familiar with the fact that the Western Gas Association is arranging for an Exhibit of the Gas Industry at the World's Fair in St. Louis, that opens May 1st, next.

The Western Gas Association herewith extends to the officers and to every member of your Association a hearty invitation to visit it, this gas display, and the Exposition, and to accept the hospitality that it is promising itself the pleasure of extending to every gas man who may this summer come within its gates.

The regular meeting of the Western Gas Association will be held this year *not* in May, as usual, but in the middle of June. You are cordially invited to visit St. Louis in that week if possible and participate in our convention, in addition to visiting the Exposition and the gas display.

The exhibit that the Western Association is arranging, while including, naturally, standard things with which we are familiar, will nevertheless include a number of new features that will make it of special interest and particularly worth while to visit. We shall have, for instance, an operating model of the new centrifugal coal projecting machine for charging retorts in an entirely new, ingenious and efficient manner; samples of incandescent mantle burners of *inverted* or pendant form, something not heretofore on the market in this country; a showing of station meters with an entirely new style of index, superior to that we are accustomed to; samples of concrete purifier construction, and apparatus illustrating the handling of gas at high pressure and numerous other novelties and innovations.

The Western Gas Association has worked hard to arrange an exhibit that it believes will be creditable, not alone to it, but to the whole industry to which we are all loyal, and it believes it has succeeded.

It asks you to come and judge for yourselves; visit with us in St. Louis in the middle of June next, and accept the hospitality of the Western Gas Association there. Yours truly, F. H. SHELTON, President.

The President—We have also, as bearing on the same question, two other invitations, one to the Gas Congress[1] to be held in June, under the auspices of the American Gas Light Association, June 15, 16 and 17, and one to the International Engineering Congress, to be held in St. Louis, October 3d to 6th, under the direction of the American Society of Civil Engineers.

The Secretary read the invitations and the President asked for an expression of the will of the Association in connection therewith.

Captain White—I move that this Association accept the several invitations and appoint the committee asked for with reference to the Gas Congress and as to the meeting of the Western Gas Association.

Mr. Shelton—Mr. President, I think some remarks on the subject would be appropriate, as perhaps giving a little more information than

1. For this invitation, see JOURNAL, Feb. 29, 1904; p. 329.

is contained in the two letters. I am not on the committee of the Congress matter that has been arranged, and am speaking only for the Western Gas Association at the moment. In connection with the invitation which it has been my pleasure, representing the Western Association, to extend to the New England Association as the first of the spring meetings of this year, in which you are asked to come and accept our hospitality there, I want to say I think few of us realize or have realized how much there will be to interest us in June in St. Louis. I certainly had no idea of the immensity of the Exposition that will frankly be the great feature of that city this coming summer. There have been a number of Expositions in the United States in the last generation, but only two have heretofore ranked in the class of International Expositions—that in Philadelphia in 1876 and that in Chicago in 1893. There have been lesser ones at Buffalo, Charleston, Omaha and other places, but only two have heretofore, I believe, ranked as *great* Expositions of the energies and scientific development and the progressiveness of this nation with the other nations allied as co-exhibitors. In this year a third such Exposition will take place—that is, the Louisiana Purchase Exposition—and you can get an idea of what it will be when I tell you that it is 50 per cent. larger than the Chicago Exposition. We realize that the Chicago Exposition had 700 acres within its inclosed ground; St. Louis will have over 1,200 acres, and a floor space 50 per cent. in excess—all absolute, housed, exhibit floor space—for the exhibition that will there be made. I certainly had no idea of the greatness of the Exhibition that is there being arranged until I visited St. Louis last October. The building in which the Western Gas Association has arranged for its display—as a suitable thing to be done by a Gas Association in connection with such an Exposition—is 500 feet wide and 750 feet long, and there are 6 or 7 such buildings, to say nothing of scores of lesser buildings. The Western has arranged for a very suitable space in the absolute center of one of these chief buildings. Arrangements are well in hand, and we are working along to a successful conclusion. We shall make, we entirely believe, a most creditable showing, not alone of that which is within our knowledge in the gas business, but of many things which are new to us in the business; such things as the new centrifugal coal projector, concrete construction work, to which the President referred in his address, high pressure gas distribution, incandescent burners of inverted form, where heretofore we have been accustomed to the vertical and chimney form, and many novelties which are absolutely worth while to become familiar with, and which will first practically be shown in this gas display. The Western you are familiar with already as an Association, and it takes great pleasure in extending its invitation to you to come and meet with it. That week will be about the middle week in June, in which Tuesday, the 14th, will be the meeting day of the Western Gas Association. As an evidence of its desire to co-operate in the Congress of American Gas Associations, which has also been arranged for that week, it was decided, as has been stated, to have a short session on its own account and then adjourn, to reconvene the following day as part of that Congress. I say to you gas men here that the second week in June will be a week in which there will be "something doing" in gas circles in the United States. We will have the annual meeting of the second largest Association in this country, the Western; we will have hundreds of delegates and members from the 10 other bodies of gas people in this country, and I think an aggregation of visiting gas men and a display of gas equipment and novelties such as we have never had the pleasure of having before, in connection with the exhibit of the Exposition itself, which is more than worth while to see. It does not need much of a *sesame* to receive our hospitality there, but, simply to make sure that you will be identified and recognized, the Western has prepared a small button as a souvenir, and as a reminder, to you gentlemen. Kindly wear it, and bear in mind that the possession of that button is an open *sesame* to a variety of things in St. Louis, and I am sure that you will find that the ownership and recognition of that button will be all sufficient to put you next, as the expression is, to all that is going on and worth while in St. Louis the second week in June. Just one further thought, and that is that there is always a sentimental value attached to the first button that has been issued in such a connection, and I am going to honor the President of this Association by presenting to him the *first* button that has been given out in this connection. (Applause.) The fact that about 50 other first buttons have already been given out simply shows the liberality of spirit and broad point of view of the Western Association. (Laughter and applause.)

The President—I think Mr. Shelton has amply demonstrated that he never gives out. (Laughter). A further word has to be said upon this matter, and there is a motion pending.

Mr. C. J. R. Humphreys—There are two thoughts that occur to me in regard to the proposition which is being laid before you by the Gas Congress Committee, of which I have the honor to be Chairman, to join with us in this Gas Congress. The first thought in my mind is this: A great many other industries are intending to hold congresses in St. Louis during the coming summer. You have had an invitation read to you from one; many of us, perhaps all of us, are members of the Electric Congress which is to be held there, and there are a great many more. It seems to me that the gas interests have in the past been rather backward in movements of that kind; they have not taken advantage of these expositions to get together in a broad way and discuss broad questions in a way that would attract the attention of the world at large. I feel, on that account alone, that a Gas Congress would be of great benefit to the gas industry, and on that account alone I would be more than glad to see the New England Association accept the invitation to join with us in making that Congress the success which I am sure it will be. Then there is the second line of thought which occurs to me. I have had the question put to me several times since this Gas Congress matter was broached: "What is the good of it from the gas man's standpoint? What is the good of it? What benefits will accrue from it that do not come from a meeting of our ordinary associations?" In answering questions of that character my mind drifts back to the time when I was Secretary of the American Gas Light Association. A good many of the gentlemen who are present here now know that in those days I used to put a great deal of effort and time and energy into drumming up the attendance of the members of the American Gas Light Association at our annual meetings. Not only have I appealed personally from time to time, from year to year, to gentlemen I see before me, not only have I written letters, not only have I travelled around to see some of the gentlemen, but I went a step beyond that and tried to get in touch with the gentlemen who were financially interested in the gas companies, and urge upon them the thought that they could not afford *not* to have their companies represented at the American Association meetings. Of course, I was met by the reply very often, "Well, we send our superintendent or manager to the local Associations, and we think that he gets there all the information that is to be obtained in regard to current matters relating to the gas business." I used to reply to them somewhat on the lines that, while the gas managers attending the local meetings were greatly benefited, and by meeting thus with the members of their profession in their immediate vicinity they certainly benefited very largely, nevertheless that should not stop them from going to meetings of the American Association, which was made up of members from all parts of the country, that in attendance at those meetings they would meet gentlemen who were interested in the same problems that they were interested in, but who by their environment looked at these problems from a little different viewpoint, and that in meeting these gentlemen from different parts of the country, interested in the common cause and having experiences somewhat on the same lines, they got an added benefit by the experience of these gentlemen, who met the problems, perhaps, in a little different way, and that in talking with them and hearing their papers upon these subjects, we came back from the American Association meetings, I thought, enriched by the discussions and experiences, and with a little different ideas upon how to meet these various problems than we would have had if we had not gone. Now, Mr. Chairman and gentlemen, it is on that same line of thought that I wish to speak just another word to-day. The American Association meeting, as I have said, is naturally made up of gas men from different parts of the country. The Western Association is made up of members largely in the West, with certainly a good representation from the East. But the Congress is planned on a little different lines, Mr. President. We are planning to get into that meeting the members from all parts of the country. On the Pacific Coast, in Texas and in all parts of the country we are striving to stir up a real live interest in that Congress, and get these gas men from all parts of the country to come there and meet with us and take up and discuss, not very many questions, but a few large, broad questions, and to get on those questions the experience and the thought of men of all localities. It does seem to me that not only must we as gas managers be very much benefited by attending such a Congress as that, that we cannot come away from such a meeting without being enriched by the experience which we must meet with there. But I think there is an added thought. I think that those financially interested in the gas business will find that the gas business is advanced by that Congress, that the members of the Associations meeting there, and learning more and more of the business, will and must put their business on a more permanent basis even than it is now. When all these other industries are meeting, when the electric light industry is holding its Congress, it does seem to me that it is very appropriate that we should do the same and meet in St. Louis where

there will be every attraction possible to make it pleasant, and at the same time where enough time of the meeting will be given to business. It does seem to me that it would not only be a very profitable, but a very pleasurable experience for all who attend. I can only add, Mr. President, that I hope that the New England Association, the first Association at which this invitation has been read, will join us in this Congress and appoint a committee to help make a success of it. (Applause.)

Mr. Addicks—Mr. President, may I ask Mr. Humphreys whether it is the intention to publish the papers that may be read before the various sections of this Congress in book form, so that we may preserve whatever good there is there?

Mr. C. J. R. Humphreys—Yes, sir; it is.

Mr. Wm. McDonald—Mr. President, as a member of the Western Gas Association and also a member of the Gas Congress Committee, my thought in getting up is, if possible, to add a word to what has been already said to attract your attention towards the Congress and the Western Gas Association at the same time. One thing which has not been said here, which I thought it would be well for the members to know, is that the meetings of both the Congress and the Western Gas Association will be held on the Exposition grounds. To my mind, that makes it a little easier to comtemplate having meetings of this kind during a fair. All the meetings will be on the grounds. So far as my voice goes, I am very earnest in urging not only this Association but other Associations, to take hold of this Congress matter and make it a good thing. Just a thought that came into my mind as Mr. Humphreys was speaking. If we had never had a gas association where would the gas industry have been to-day, as compared with where it is? The Congress is, to my mind, just one step higher and will help to bring all together in one common purpose.

Mr. D. R. Russell—I wish to say that the gentlemen have not touched the subject of the hotel accommodations of St. Louis. I know it is the impression that such accommodations will be limited. I can assure you, however, that large strides have been made in the last 6 months, and that they are building not only three large, fireproof, permanent hotels, to accommodate approximately 2,500 to 3,000 collectively, but they are also building four very large, temporary hotels, to hold from 5,000 to 7,000 each. Those are in and around the grounds. The buildings will be of metal, covered with plaster, and will be more fireproof than those of ordinary seaside resort construction. The hotels will be comfortably furnished and very well run. The people who have them in charge and the promoters are men of high standing in St. Louis, and, therefore, their statements can be relied on as being correct in this respect. I am sure that everyone will have comfortable accommodations, and that the transportation facilities to and from the grounds will be ample to take care of everybody.

The President—Anyone else? It has been pointed out to you that this is the first Continental Gas Congress. I suppose we may look for a new declaration of independence of electricity, and you want to all get into the camp and belong to the first Congress. Those in favor of the motion of Captain White that these invitations be accepted, that suitable responses be prepared by the Secretary and suitable committees appointed by the President, will please say aye. [Adopted.]

Mr. Shelton—Mr. President, just to make that matter a little clearer, and as there is but a short time between now and the meeting of the Congress, it seems to me it should be clearly understood that the committee to be appointed by the Chair will be appointed with power to act. As I understand it, the Congress will ask the different Associations to unite with it, form part of it, assume certain duties, do more or less of that which transpires. I think it ought to be clearly understood that the committee appointed will not have to report back to this Association, take a mail vote and all that sort of thing, but that it will be of such excellent standing among the members of this Association that they will be willing to take the chances of what that committee elects to do, and that that committee will have definite and positive power to make any other arrangement.

The President—Will this in any way involve the expenditure by the Association of funds?

Mr. Shelton—I think the membership can have confidence that the committee will not commit this Association to any expenditure without specific authority, or certainly any expenditure of any such amount as would raise any question or issue. You have enough belief in your directors and officers I am sure to repose in them confidence that they would not abuse any trust, and it would greatly expedite matters if you would give them pretty broad powers.

The President—Captain White, as the mover of this motion that has just been passed did the committee you refer to have full power?

Captain White—I assumed the question would come up and that the Association itself would direct that this committee be appointed with power. Haste being necessary, I recognize the wisdom of Mr. Shelton's suggestion that in appointing this committee it is understood by the Association that it be appointed with full power to enter in with the other committees in acting in this whole affair, and that such expenditure as it finds necessary should be passed upon by the directors of this Association.

The President—Gentlemen, you have heard this motion again, more clearly stated. Those desiring to reaffirm the vote already passed will please say aye. [Adopted.]

Gentlemen, will you listen to the very important paper on Lighting by Gas Arcs, by Mr. Hintze.

Reading the Papers.

The President introduced Mr. Thomas H. Hintze, of Lowell, Mass., who read the following paper on the

INSTALLATION AND MAINTENANCE OF GAS ARC LAMPS.

A year ago I promised our worthy Secretary a paper for this meeting, the subject of which is entirely opposite in its character than the heading of this effort, and to "square" myself with the Secretary, I thought it would interest you somewhat were I to tell you in a few words our experience and methods in introducing the gas arc lamp to the notice of the people of Lowell. I think you all agree it is a well established fact that, as a device for artificial illumination, the gas arc lamp is a decided success, and nothing that I would say at this time could point further to you the many advantages of the system. It enters the field of the electric arc and serves as an instrument to check its growth in the illumination of large areas.

I share the opinion with others that at no time could the open electric arc lamp be fairly said to be all that could be desired as a light for indoor purposes. It is but fair to state, however, that the inclosed arc lamp is a good lamp, and, when pushed with energy, has no difficulty in displacing in the lighting of large areas the ordinary gas fixtures, and all other forms of individual incandescent gas lights with unclean or broken chimneys and blackened mantles.

The gas arc lamp enters the field here, and it is only with the gas arc lamp that this competition can be successfully met.

We are justly proud of our record in this line, and with our 90 cents per 1,000 rate, established in October, 1901, we can present a very attractive proposition to the seekers for more light at a cheaper rate. In March, 1902, the gas arc lamp question was considered and 8 were installed in a store as an experiment. We were satisfied with the trial, and, beginning in June, a solicitor was engaged and the field of the electric arc was entered in good earnest. The lamps are installed in every instance free of cost to the consumer, and the maintenance charge is $2 per year per lamp. From June, 1902, to January, 1903, 1,900 gas arc lamps were installed, and during 1903 the average was about 100 per month. Removals for various causes brought the number in use at the close of 1903 to nearly 3,000.

Prompt service is given an intended customer, especially one who has been using the electric arc. Former electric lighting bills have been cut in two by the use of the gas arc lamp, and the majority of the stores in Lowell are now illuminated on a scale grander and more attractive than ever could have been imagined under the old systems. The lamps have been introduced in churches, halls, school buildings, offices, stores, shops, freight houses and mills, and in quite a number of instances in private dwellings.

The demand keeps up in a remarkable way, considering the number installed and the field to work in. The maintenance of the lamp is the key to the situation, and I cannot dwell too much on its importance to the success of the venture. Good service with capable men and regular inspection are necessary, and I would most earnestly urge upon you the importance of this branch of the service where competition is sharp.

With our 3,000 lamps 3 inspectors are employed, and they clean on an average 30 lamps each per day of nine hours, and use about 100 mantles each per week. Every lamp is cleaned and mantles supplied, if necessary, once in five weeks. Should occasion require more service and attention, a telephone call to the office is only necessary to have one of the force of lamp inspectors attend to the order.

Each lamp inspector is given a book in which are recorded the lamp customers in a district when he has covered that route, another is given him for a different part of the city. Meanwhile the additions and changes have been entered in the first book ready when it is required with all the changes up to date. The number of mantles used and

where, also shades and globes replaced, are carefully accounted for, and the cost of maintenance is known to a certainty. In our lamp experience, as in all our other departments, we have aimed to satisfy our customers first, last and always, that being one of the fundamental principles on which the policy of the Lowell Gas Light Company has always rested, and it pays, as the output of gas per capita will show. That the lamp has come to stay there is no doubt, and I prophesy as brilliant a future for the lamp as its light giving qualities emit. I would not have you infer that we do all the lighting business in Lowell. We have a worthy competitor in the shape of a well regulated electric plant. There is room for competition and it is healthy. A majority of the cotton mills operate individual electric plants. This field has been entered as an experiment with the gas arc, and so far the results are gratifying. In one mill there is a weave room with 43 four-burner arcs, which have been installed for more than a year. In different parts of the same mill there are scattered 60 more lamps. In other mills about the city quite a number have been installed in an experimental way, perhaps 200 in all. To the corporations we sell the lamp outright at a reduced figure from cost, and mantles and glassware at actual cost. The corporations maintain the lamps on their own premises after they are once installed by the gas company.

The cheapening of the selling rate is bound to come in time, and the illumination of large areas with the gas arc will grow apace, and become an important part in the business of selling gas.

If I have interested you, or have given you a new thought to carry home, I will have been more than repaid for the effort and time in gathering together these facts, snatched a little at a time when opportunity afforded.

(To be Continued.)

Maintenance of Incandescent Gas Burners.

[A paper read by MR. E. HAASE, Secretary Milwaukee Gas Light Company, at the Third Annual Meeting, Wisconsin Gas Association.]

The arguments in favor of gas companies maintaining incandescent burners have frequently been presented, and in the discussions following quite generally concurred in. It is when anyone has had his own first experience with it that the subject is discussed and the necessity for burner maintenance by gas companies argued anew. So it is in the present case.

A little over a year ago, the writer, then in the position of superintendent of the new business department, urged the necessity of the gas company undertaking to maintain illuminating burners, on account of the deplorable conditions then existing, particularly in regard to store lighting. A canvas was made intending to show the conditions in regard to store lighting, the kind of maintenance service furnished by private parties, and the attitude of the consumer with respect to these conditions. A great many cases were found where conditions were so bad that it seemed impossible that a consumer should put up with such a state of affairs.

One clothing store furnished a fair illustration of what was found. In it we found an assortment of all the different types of incandescent burners that had ever appeared, with the exception of the latest types; cluster lamps were found in which no two burners were of the same type, and numerous burners were found with parts of different types, some burners burning in the mixer, some blackened at the top, others only one-half incandescent, etc., and this store was paying a dealer for a maintenance service.

With the consent of the management, two men were put at the work remedying some of the worst conditions without, however, having any definite plan to work upon. A few months later another phase of the question presented itself to us. The Company had been instrumental in introducing, through a manufacturer's agent, about 400 or 500 Humphrey arc lamps, and the problem of maintaining them, thus insuring satisfactory service from them, was before us. The organization of a burner maintenance force was then decided upon. The service which the Company offered to give to its consumers was announced in a circular as follows:

"The Milwaukee Gas Light Company begs to announce the inauguration of a plan for the maintenance of burners, to be put into effect June 1st, which, in the interest of good service to gas consumers, seems a necessity. Gas burners, especially the incandescent mantle burners, require correct adjustment as well as frequent cleaning to maintain them at the best efficiency. Two classes of service will be maintained.

"(1.)—For business places:

"Regular visits once a week, at which all the burners will be inspected and cleaned, the glassware cleaned and broken mantles and glassware replaced. The rates for this service will be: Eight cents per lamp per month; Humphrey and Welsbach arc lamps, 25 cents per month—four-light cluster lamps are considered four burners. Above charges include all materials furnished, which will be the best of the kind in every case.

"(2.)—For residences and dwellings, a service will be furnished upon the following terms:

"Upon request by postal card, the Gas Company will send a man promptly to attend to burners, and the consumer will be charged as follows: For each burner cleaned and adjusted, 5 cents will be charged, besides the cost of the material furnished at the following rates: No. 197 Welsbach mantles at 30c.; 'Gas-Co.' mantles, 30c.; 'Capital' mantles, 25c.; 'M. G. L.' mantles, 20c.; chimneys, 8c.; crimped shades, 8c.; Bray burners (open flame) no charge.

"The first class of service, generally intended for places of business, may also be subscribed for by consumers for their dwellings, and the second class of service may be called for by business places if desired. For this work the Gas Company will employ only men that understand burner work thoroughly, and they will be instructed to spend sufficient time to enable them to do the work in a first-class manner. Inspectors will be employed to see that the work is kept up to a high standard. It is thought that this plan of maintenance will meet the requirements of the service, and the rates charged are less than the class of service, which will be furnished, will cost. Our plan contemplates the handling of the most efficient types of burners, and the highest grades of mantles only. It is economy to use the best and our interests are mutual.—MILWAUKEE GAS LIGHT COMPANY."

It was believed at the time the above rates for burner maintenance were put into effect, that they would barely cover the cost of such service, but that it was necessary to make the rates as low as possible in order to make the service effective in bringing about a better condition in regard to store lighting. The low rate for maintenance of arc lamps was also deemed a desirable thing on account of the aid it would be in the introduction of arc lamps by the gas company, which was to be a feature of the new business campaign for the season then before us.

As this maintenance work was begun in mid-summer, at a time when the lighting question is of minor importance as compared with the fall and winter, we were enabled to go into it gradually. Requests for maintenance under our contract system were not numerous until the early fall months, and for this reason the data given cover the records of the last quarter of 1903, only.

Cost of Maintenance of Arc Lamps and Single Incandescent Burners for Last Quarter of 1903, *Under Contract.*

Average number of contracts in force		850
Total number of visits made, 3 months		9,515
Average number of arc lamps under contract		1,078
Average number of single burners under contract		3,555
Total number of mantles used on contracts		6,716
Total number of chimneys used on contracts		2,748
Total number of shades and sundries used on contracts		227
Number of mantles used per burner per quarter (counting arc lamps 4 burners)	.85	
Number of chimneys used per single burner per quarter	.77	
Cost of material per burner per quarter	11.7	cents.
Cost of labor per burner per quarter	11.5	"
Cost of supervision and inspection per burner per quarter	4.2	"
Total cost per burner per quarter	27.4	"

Upon Request.

Number of orders executed	880
" burners trimmed	1,578
" mantles used	1,389
" chimneys used	455
" shades and globes used	61
" burner parts used	162

	Total.	Per Burner Trimmed.
Cost of above material	$285.08	.18
Cost of labor on above	78.28	.049
Total cost	363.36	.23
Charged consumer	492.99	.31
Profit	129.63	.08

From these figures it appears that our rates for contract mainten-

ance are about 9 cents per arc lamp and 4 cents per single burner below the actual cost of service. For obvious reasons the service given must be the best; the consumer will not put up with any other from the gas company. He will exact all he can because his bills are high enough to entitle him to it, he thinks. Therefore, I do not believe the cost of the service can be materially reduced under the conditions surrounding us.

The commercial advantages that have accrued to us through this maintenance service have been very marked. Just how much it has aided in the introduction of Humphrey arc lamps must remain a matter for conjecture, but it is only fair to state that the superintendent of new business is very positive in his assertion that the maintenance proposition was an important factor. He believes it is not possible to introduce arc lamps and *keep them in use* against electric competition without a system of maintenance that will insure lighting which will satisfy the consumer.

The conditions in regard to store lighting of a year ago have been very materially improved. Poor gas lighting will not entirely disappear, for there will always be such who will neither pay a reasonable charge for maintenance, nor learn how to and take care of burners themselves.

The writer has had the unique experience this winter of having consumers find fault about the size of their illuminating bill, and in the same breath acknowledge and emphasize that their light was good. In these cases the maintenance service removed any cause for *complaint* and made it very easy to satisfy the consumer that he had received actual value for the amount of money he was called upon to pay. Our troubles in the way of complaints have been prevented, at least to a considerable extent, by this service.

Moisture and Condensing Gas Stoves.[1]

Communicated by Mr. F. R. E. Branston.

When a condensing gas stove, in operation, is shown to emit vapors from any of its component parts, proof is at once given that it is working beyond its capacity, and that it no longer is of hygienic value. The condensed liquid arising from the combustion of the hydrogen and hydrocarbons in the gas, will then be found to decrease in proportion to the gas consumed, and the sulphur compounds in the liquid or water will decrease in like manner, as the products of combustion are then carried off into the air with the vapor or moisture arising from the stove.

That there is no unpleasant odor arising from the combustion of gas in a condensing gas stove is no proof that the products of combustion are not escaping into the air. The best means of discovering if the vapor is escaping, and if the atmosphere is being vitiated, is to detect the vapor by means of a hand glass; and when this is done, it will be found that the vapor escapes from different stoves in different parts of the stoves; and if no adequate means are adopted for dealing with the vapor, the light will be put out by the products of combustion which rise with the vapor and fall on the burner. Another proof is to measure the condensed liquid or water, when it will be found that—instead of increasing in proportion to the larger quantity of gas consumed—it will decrease; and as the condensed liquid decreases, so the vapor will be found to increase, taking with it the products of combustion which vitiate the air.

The question of dealing with the vapor is the most important consideration in the manufacture of condensing gas stoves, as it has been shown that, if it is ignored, the light will be put out, and if allowed to escape, the air becomes vitiated by the products of combustion. If the vapor is not condensed, the right amount of liquid is not obtained; the latent heat from the gas is not all given up, and the analysis will not show the correct amount of sulphur compounds which should be found in the condensed liquid when the stove is working within its capacity. A stove which will condense the products of combustion from 6 cubic feet per hour, and deal with them in a satisfactory manner, without producing vapor, will be found on burning 9 cubic feet of gas per hour (if it then produces vapor) to separate less sulphur in proportion from the gas than the 6 cubic feet. This proves that a small portion of the products is dealt with, and that the rest are allowed to escape into the air; or, to put it in another way, the action of condensation on the 6 cubic feet is impeded, and will not show such good results, while the products of the combustion of the remaining 3 cubic feet of gas are not condensed, but merely turned to vapor, which escapes from the stove.

The first condensing gas stoves that were made had no provision for the escape of the vapor, but being very large, and fitted with sheet iron tubes, having an inside tube through which the air was allowed a free passage, they were quite within the necessary capacity for dealing with a small quantity of gas. But when the size was decreased, a different arrangement with regard to the iron interior tubes was resorted to; and when vapor was formed, provision was made that it might escape from them into the air. A subsequent form was made, which discarded the inner side tubes, with the air passing through them, and carried the vapor up the back of the stove, into the center tube over the burner, where it was heated before leaving the stove and mixing with the air. I think this was advertised as a condensing gas stove "giving a nice, moist heat." Subsequently, the same sort of thing was done with a coil, and other methods were resorted to—such as making the aperture at the base of the stove larger, when the vapor was found to condense on the outside of the base, and drip on the floor, when it escaped in that way. Nearly all the stove makers have tried to construct these stoves, without being able to overcome this difficulty of the products of combustion escaping with the vapor. When the vapor is allowed to escape, it naturally follows that the carbonic acid gas also escapes, as the pressure is decreased, and the condensed liquid is decreased. Water will hold its own volume of carbonic acid gas, as this gas is not condensed, but is acted upon by pressure, and is found in the water when the stove is working within its capacity. In some cases, the makers would have us believe that their stoves produced a small pailful of liquor in 24 hours; but half the quantity named on the circulars would be all that it would be possible to obtain from the gas which is consumed in their stoves, and about a quarter of what they state is what is found when the stoves are tested.

The competition in these stoves has been keen, and the quantity of gas which could be properly condensed (to deal perfectly with the products of combustion) was small in comparison with the size of the stove; so that they were costly to make. Consequently, the temptation to the makers to send out stoves burning more gas than they were competent to thoroughly condense was great; and large numbers of imperfect stoves of this kind have been sold, and are now constantly met with.

Under the foregoing circumstances, it is not a matter for much wonder that Professor Lewes, in his Cantor Lectures delivered about a year ago at the Society of Arts, should have expressed such a poor opinion of the condensing gas stoves that had up to that time come under his notice, and the defects of which were well known to him. I have learned, however, from men of science, both in this country and abroad, that wholesale condemnation of a useful system, without any suggestion for improvement, does not advance mechanical knowledge. Up to this period, the makers seem merely to have endeavored to carry out in the stoves what they saw take place in a room, when overheated with ordinary gas burners. The products of combustion were cooled, by coming in contact with the cold walls and the glass of the windows, moisture was seen to be formed, and they were satisfied with merely disposing of the troublesome vapor, by allowing it to escape from the stove—taking with it a large portion of the products of combustion.

The improvements which have recently been made in this system of condensing gas stoves go much more carefully into the question of following out the natural action which governs the gradual condensation, and which produces liquid from heated gases, as it not only carries out roughly the action which is brought about as regards condensation when a room is overheated by gas consumed with ordinary burners, but it performs three distinct actions which are constantly taking place in the atmosphere. It also performs these three actions all at the same time, in a very small space, dealing with the vapor according to the natural laws of evaporation, vaporization and condensation, without allowing any of it to escape into the air.

In this apparatus, the first thing that is aimed at is to produce as much vapor as possible, and then to make use of it. The combustion products or gases rising from the gas consumed by the burner form vapor, which rises in the same manner as the heat rises from the earth to form clouds. The vapor is drawn off, or induced into separate tubes from below, as the air in them is warmer than the base (in like manner that the mist or vapor rises from the earth when the air is warmer than the earth); and when the temperature of the air is increasing, its capacity for holding vapor increases. Then, when the air is saturated with vapor, it deposits moisture on becoming cool, forming dew or rain. This action takes place in the cool part of the outside columns, and in this manner the moisture or water is formed which carries with it the sulphur and other impurities.

There is another action which takes place in these stoves, which has its counterpart in the natural action that is constantly taking place in the atmosphere. Evaporation never takes place without the evolution

1. *Journal of Gas Lighting.*

of electricity; and when the electric current is withdrawn globules of rain are formed. The electric current formed in this manner in the stove passes out with the radiant heat, when the vapor is condensed into a state of water: and I have found a considerable current produced in this manner, which, with thermo-electric instruments I constructed for the purpose, according to the tests I made, appears to give about 1 volt for every cubic foot of gas consumed in the stove.

Standard Specifications for Cast Iron Pipe and Special Castings.[1]

Description of Pipes.—Section 1. The pipes shall be made with hub and spigot joints, and shall accurately conform to the dimensions given in Tables Nos. 1 and 2. They shall be straight and shall be true circles in section, with their inner and outer surfaces concentric, and shall be of the specified dimensions in outside diameter. They shall be at least 12 feet in length, exclusive of socket. For pipes of each size from 4-inch to 24-inch, inclusive, there shall be two standards of outside diameter, and for pipes from 30-inch to 60-inch, inclusive, there shall be four standards of outside diameter, as shown by Table No. 2.

All pipes having the same outside diameter shall have the same inside diameter at both ends. The inside diameter of the lighter pipes of each standard outside diameter shall be gradually increased for a distance of about 6 inches from each end of the pipe so as to obtain the required standard thickness and weight for each size and class of pipe.

Pipes whose standard thickness and weight are intermediate between the classes in Table No. 2 shall be made of the same outside diameter as the next heavier class. Pipes whose standard thickness and weight are less than shown by Table No. 2 shall be made of the same outside diameter as the Class A pipes, and pipes whose thickness and weight are more than shown by Table No. 2 shall be made of the same outside diameter as the Class D pipes.

For pipes 4-inch to 12-inch, inclusive, one class of special castings shall be furnished, made from Class D pattern. Those having spigot ends shall have outside diameters of spigot ends midway between the two standards of outside diameter as shown by Table No. 2, and shall be tapered back for a distance of 6 inches. For pipes from 14-inch to 24-inch, inclusive, two classes of special castings shall be furnished, Class B special castings with Classes A and B pipes, and Class D special castings with Classes C and D pipes, the former to be stamped "AB" and the latter to be stamped "CD." For pipes 30-inch to 60-inch, inclusive, four classes of special castings shall be furnished, one for each class of pipe, and shall be stamped with the letter of the class to which they belong.

Allowable Variation in Diameter of Pipes and Sockets.—Sec. 2. Especial care shall be taken to have the sockets of the required size. The sockets and spigots will be tested by circular gauges, and no pipe will be received which is defective in joint room from any cause. The diameters of the sockets and the outside diameters of the bead ends of of the pipes shall not vary from the standard dimensions by more than .06 of an inch for pipes 16 inches or less in diameter; .08 of an inch for 18-inch, 20-inch and 24-inch pipes; .10 of an inch for 30 inch, 36-inch and 42 inch pipes; .12 of an inch for 48-inch, and .15 of an inch for 54-inch and 60-inch pipes.

Allowable Variation in Thickness—Sec. 3. For pipes whose standard thickness is less than 1 inch the thickness of metal in the body of the pipe shall not be more than .08 of an inch less than the standard thickness, and for pipes whose standard thickness is 1 inch or more, the variation shall not exceed .10 of an inch, except that for spaces not exceeding 8 inches in length in any direction, variations from the standard thickness of .02 of an inch in excess of the allowance above given shall be permitted.

For special castings of standard patterns a variation of 50 per cent. greater than allowed for straight pipe shall be permitted.

Defective Spigots may be Cut.—Sec. 4. Defective spigot ends on pipes 12 inches or more in diameter may be cut off in a lathe and a half round wrought iron band shrunk into a groove cut in the end of the pipe. Not more than 12 per cent. of the total number of accepted pipes of each size shall be cut and banded, and no pipe shall be banded which is less than 11 feet in length, exclusive of the socket.

In case the length of ptpe differs from 12 feet, the standard weight of the pipe given in Table No. 2 shall be modified in accordance therewith.

Special Castings.—Sec. 5. All special castings shall be made in accordance with the cuts and the dimensions given in the table forming a part of these specifications.

1. Proposed by Committee B of the International Association for Testing Materials.

The diameters of the sockets and the external diameters of the bead ends of the special castings shall not vary from the standard dimensions by more than .12 of an inch for castings 16 inches or less in diameter; .15 of an inch for 18-inch, 20-inch and 24-inch; .20 of an inch for 30-inch, 36-inch and 42 inch, and .24 of an inch for 48-inch, 54-inch and 60-inch. These variations apply only to special castings made from standard patterns.

The flanges on all manhole castings and manhole covers shall be faced true and smooth, and drilled to receive bolts of the sizes given in the tables. The manufacturer shall furnish and deliver all bolts for bolting on the manhole covers, the bolts to be of the sizes shown on plans and made of the best quality of mild steel, with hexagonal heads and nuts and sound, well fitting threads.

Markings.—Sec. 6. Every pipe and special casting shall have distinctly cast upon it the initials of the maker's name. When cast especially to order, each pipe and special casting larger than 4-inch may also have cast upon it figures showing the year in which it was cast and a number signifying the order in point of time in which it was cast, the figures denoting the year being given above and the number below, thus:

1901	1901	1901
1	2	3

etc., also any initials, not exceeding four, which may be required by the purchaser. The letters and figures shall be cast on the outside and shall be not less than 2 inches in length and ¼ of an inch in relief for pipes 8 inches in diameter and larger. For smaller sizes of pipes the letters may be 1 inch in length. The weight and the class letter shall be conspicuously painted in white on the inside of each pipe and special casting after the coating has become hard.

Allowable Percentage of Variation in Weight.—Sec. 7. No pipe shall be accepted the weight of which shall be less than the standard weight by more than 5 per cent. for pipes 16 inches or less in diameter, and 4 per cent. for pipes more than 16 inches in diameter, and no excess above the standard weight of more than the given percentages for the several sizes shall be paid for. The total weight to be paid for shall not exceed for each size and class of pipe received the sum of the standard weights of the same number of pieces of the given size and class by more than 2 per cent.

No special casting shall be accepted the weight of which shall be less than the standard weight by more than 10 per cent. for pipes 12 inches or less in diameter, and 8 per cent. for larger sizes, except that curves, Y-pieces and breeches pipe may be 12 per cent. below the standard weight and no excess above the standard weight of more than the above percentages for the several sizes will be paid for. These variations apply only to castings made from the standard patterns.

Quality of Iron.—Sec. 8. All pipes and special castings shall be made of cast iron of good quality, and of such character as shall make the metal of the castings strong, tough and of even grain, and soft enough to satisfactorily admit of drilling and cutting. The metal shall be made without any admixture of cinder iron or other inferior metal, and shall be remelted in a cupola or air furnace.

Tests of Material.—Sec. 9. Specimen bars of the metal used, each being 26 inches long by 2 inches wide and 1 inch thick, shall be made without charge as often as the engineer may direct, and, in default of definite instructions, the contractor shall make and test at least one bar from each heat or run of metal. The bars, when placed flatwise upon supports 24 inches apart and loaded in the center, shall for pipes 12 inches or less in diameter support a load of 1,900 pounds and show a deflection of not less than 0.30 of an inch before breaking, and for pipes of sizes larger than 12 inches shall support a load of 2,000 pounds and show a deflection of not less than 0.32 of an inch. The contractor shall have the right to make and break three bars from each heat or run of metal, and the test shall be based upon the average results of the 3 bars. Should the dimensions of the bars differ from those above given, a proper allowance therefor shall be made in the results of the tests.

Casting of Pipes.—Sec. 10. The straight pipes shall be cast in dry sand molds in a vertical position. Pipes 16 inches or less in diameter shall be cast with the hub end up or down, as specified in the proposal. Pipes 18 inches or more in diameter shall be cast with the hub end down.

The pipes shall not be stripped or taken from the pit while showing color of heat, but shall be left in the flasks for a sufficient length of time to prevent unequal contraction by subsequent exposure.

Quality of Castings.—Sec. 11. The pipes and special castings shall be smooth, free from scales, lumps, blisters, sand holes and defects of every nature which unfit them for the use for which they are intended. No plugging or filling will be allowed.

Cleaning and Inspection.—Sec. 12. All pipes and special castings shall be thoroughly cleaned and subjected to a careful hammer inspection. No casting shall be coated unless entirely clean and free from rust, and approved in these respects by the engineer immediately before being dipped.

Coating.—Sec. 13. Every pipe and special casting shall be coated inside and out with coal tar pitch varnish. The varnish shall be made from coal tar. To this material sufficient oil shall be added to make a smooth coating, tough and tenacious when cold, and not brittle nor with any tendency to scale off.

Each casting shall be heated to a temperature of 300° F. immediately before it is dipped, and shall possess not less than this temperature at the time it is put in the vat. The ovens in which the pipes are heated shall be so arranged that all portions of the pipe shall be heated to an even temperature. Each casting shall remain in the bath at least 5 minutes.

The varnish shall be heated to a temperature of 300° F. (or less if the engineer shall so order), and shall be maintained at this temperature during the time the casting is immersed.

Fresh pitch and oil shall be added when necessary to keep the mixture at the proper consistency, and the vat shall be emptied of its contents and refilled with fresh pitch when deemed necessary by the engineer. After being coated the pipes shall be carefully drained of the surplus varnish. Any pipe or special casting that is to be recoated shall first be thoroughly scraped and cleaned.

Hydrostatic Test.—Sec. 14. When the coating has become hard, the straight pipes shall be subjected to a proof by hydrostatic pressure, and, if required by the engineer, they shall also be subjected to a hammer test under this pressure.

The pressures to which the different sizes and classes of pipes shall be subjected are as follows:

	20-Inch Diameter and Larger. Pounds Per Square Inch.	Less than 20-Inch Diameter. Pounds Per Square Inch.
Class A pipe..	150	300
" B "	200	300
" C "	250	300
" D "	300	300

Weighing.—Sec. 15. The pipes and special castings shall be weighed for payment under the supervision of the engineer after the application of the coal tar pitch varnish. If desired by the engineer, the pipes and special castings shall be weighed after their delivery, and the weights so ascertained shall be used in the final settlement, provided such weighing is done by a legalized weigh master. Bids shall be submitted and a final settlement made up on the basis of a ton of 2,000 pounds.

Contractor to Furnish Men and Materials.—Sec. 16. The contractor shall provide all tools, testing machines, materials and men necessary for the required testing, inspection and weighing at the foundry of the pipes and special castings; and should the purchaser have no inspector at the works, the contractor shall, if required by the engineer, furnish a sworn statement that all of the tests have been made as specified, this statement to contain the results of the tests upon the test bars.

Power of Engineer to Inspect.—Sec. 17. The engineer shall be at liberty at all times to inspect the material at the foundry, and the molding, casting and coating of the pipes and special castings. The forms, sizes, uniformity and conditions of all pipes and other castings herein referred to shall be subject to his inspection and approval, and he may reject, without proving, any pipe or other casting which is not in conformity with the specifications or drawings.

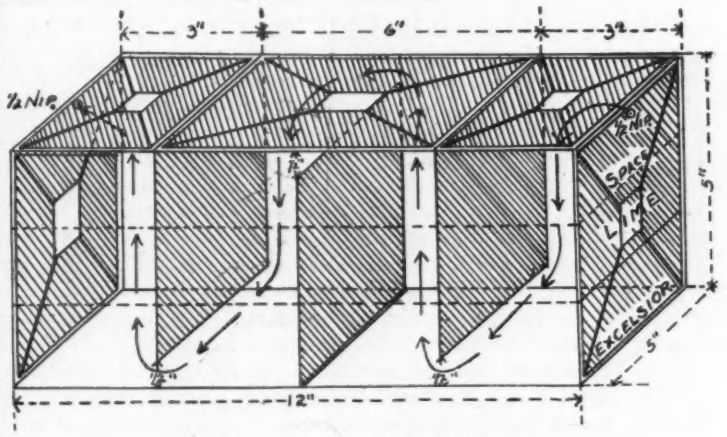
Inspector to Report.—Sec. 18. The inspector at the foundry shall report daily to the foundry office all pipes and special castings rejected, with the causes for rejection.

Castings to be Delivered Sound and Perfect.—Sec. 19. All the pipes and other castings must be delivered in all respects sound and conformable to these specifications. The inspection shall not relieve the contractor of any of his obligations in this respect, and any defective pipe or other castings which may have passed the engineer at the works or elsewhere shall be at all times liable to rejection when discovered, until the final completion and adjustment of the contract; provided, however, that the contractor shall not be held liable for pipes or special castings found to be cracked after they have been accepted at the agreed point of delivery. Care shall be taken in handling the pipes not to injure the coating, and no pipes or other material of any kind shall be placed in the pipes during transportation or at any time after they receive the coating.

Definition of the Word "Engineer."—Sec. 20.—Wherever the word "engineer" is used herein it shall be understood to refer to the engineer or inspector acting for the purchaser and to his properly authorized agents, limited by the particular duties intrusted to them.

A Useful Form of Dehydrator.

Mr. F. C. Shepard, Superintendent of the Minneapolis (Minn.) Gas Light Company, writing to us some weeks ago, inclosed a sketch of a dehydrator as shown in the accompanying illustration, that has been



Dehydrator. Minneapolis Gas Light Company.

successfully used by him for the past 4 years. It is a calcium of lime dehydrator and is employed in connection with outside arc lighting. The apparatus, which is made of galvanized iron, is filled about one-third with coarse excelsior, then with three (or abont one-third of the space) parts pulverized or broken calcium of lime. The gas is allowed to enter and pass through the lime, taking out all moisture and preventing any possibility of freezing or trouble in the outside arc. There are something like 250 of these in use in Minneapolis. Mr. Shepard says that the working of the apparatus depends largely upon the filling. He notes there should be no lime used in this filling larger than an ordinary hickory nut, and all the fine pieces that are broken off in the process of crushing the larger lumps should be filled in so as to leave as few open spaces for the gas to pass through as possible.

The Seattle Municipal Light and Power Plant.[1]

By Mr. R. E. Heine.

The city of Seattle (population 140,000) is at present planning and erecting an electric power plant and transmission system for the purpose of supplying the city with electric light and power. The electric current generated is to be used, first, for street lighting, operating series incandescent and arc lamps, and later on for the operation of alternating current motors and ordinary incandescent lights. No direct current distribution is being planned for at present. The system at present includes a generating station near Cedar Lake, about 40 miles southeasterly from Seattle, two 3-phase transmission lines and a distributing station at Seattle.

Power will be generated at 2,300 volts, 60 cycles, 3-phase. This will be stepped up to 44,000 volts and transmitted to Seattle over two 3-phase lines. At Seattle the current will be stepped down to 2,200 volts and changed to 2-phase.

At the present time the lights and motors in Seattle are operated by two companies, both using a 60-cycle, 2-phase system; furthermore, all of the load for the first few years will consist of arc and incandescent lights only. Hence, it was decided to adopt the rather high frequency of 60 cycles per second, and permit a switching of the load from one station to another in case of accident. The distributing station in Seattle will be provided with synchronizing devices, which allow for the supplying of power for the principal circuits during a shut down of any one plant through accident or otherwise.

The source of water supply, Cedar Lake, is a clear body of water about 3½ square miles in area situated in the lower Cascade Mountains, 1,535 feet above sea level. The lake is also the source of Seattle's water supply, which is carried to the city partly by the Cedar River and partly by a 48-inch wooden stave pipe. The idea of locating a municipal power station at this lake originated with the present city engineer, Mr. R. H. Thomson. The city owns the river for water supply and a greater part of the pipe line, which the transmission line will follow for 28 miles.

About one-half mile below the lake a substantial timber dam has been constructed, and from this a 40-inch wooden stave pipe joined

1. *Electrical World and Engineer.*

further on to a steel pipe carries the water to a point 3½ miles below to the site of the present power house. The gross head of water is 610 feet, and the effective head at the turbines is 560 feet. The wooden stave pipe is of fir, 1⅝-inch thick and has a total length of 15,729 feet. The riveted steel pipe is 48 inches in diameter, the plates are $\frac{3}{16}$-inch thick at the upper end and $\frac{5}{16}$-inch thick at the power house. The stave pipe is being made at the city's saw mill at Cedar Lake and the steel pipe was furnished by the T. A. Gillespie Company, of Pittsburg.

The total available amount of power is 30,000-horse power, but at present but 5,000-horse power will be developed. In order to utilize the total power additional storage reservoirs are required.

Two Pelton water wheels, of the 2-wheel type, will furnish power to the generators. The wheels are direct connected to the generators, and operate at 400 r.p.m. They are capable of developing 50 per cent. overload and are guaranteed to operate at a minimum efficiency of 80 per cent. at full load. A Lombard governor controls each wheel. Two 125-horse power wheels, running at 525 r.p.m., furnish power for the exciters, and are controlled by one Lombard governor.

The generators are standard machines of the Bullock Electric Company, of 1,200-kw. output, 2,300 volts, 60 cycles, 3-phase, of the revolving field type. The guaranteed efficiency of the generators is 95 per cent. at full load and the regulation is 8 per cent. on non-inductive load, 16 per cent. for a power factor of .9 and 20 per cent. for a power factor of .9, speed and excitation remaining constant. Two generators will be installed at present, but the plant is so arranged that additions may be made without interrupting the service.

The exciters are in duplicate, and of 75-kw. capacity, 125 volts, compound wound. Either exciter is capable of furnishing current for both generators for the lights in the station and for operating the motors in the station. This arrangement keeps one exciter in reserve for emergency service. Fig. 1 shows a ground plan of the station and the surrounding buildings and Fig. 2 gives sectional elevations of the same.

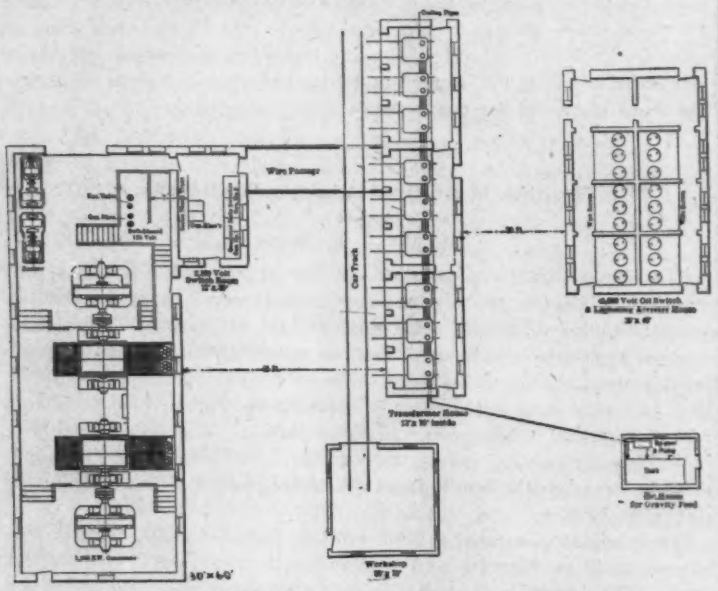


Fig. 1.—Ground Plan of Seattle Generator Station and Main Buildings.

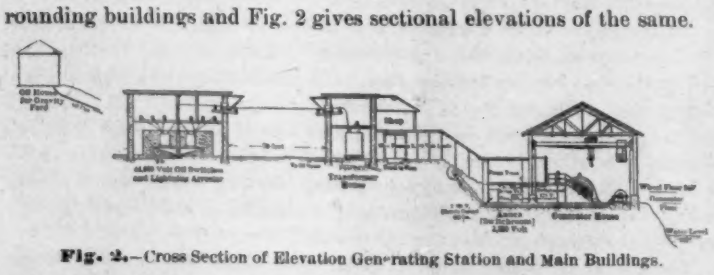


Fig. 2.—Cross Section of Elevation Generating Station and Main Buildings.

The switchboard at the generating station is placed on an elevated platform at one end of the present building, overlooking the machines. When the entire plant will have been erected it will occupy a central position. The board is made of Vermont marble, and is but 8 feet long and 90 inches high, containing but 4 panels, 2 for the generators and 2 for the exciters. There are no alternating current busbars and consequently there is no need for any transformer panels. A space of 4 feet is left between the wall and the board, and all instrument and pilot wires pass down the back of the board, underneath the floor and through a wall to an annex 12 feet by 20 feet. Here are kept all the switchboard transformers, shunts, exciter and generator rheostats and the electrically operated oil switches.

The exciter rheostats are controlled by means of a chain and sprocket wheel from the panel, and the generator rheostats from pedestals with hand wheels in front of the panel. This gives an arrangement absolutely clearing the board of all dangerous voltages, and at the same time minimizing the amount of wiring to the panels. The exciter wheel pipes run directly under the switchboard platform; valves are connected in here and pedestals for their control are placed on each side of the rheostat pedestals.

A motor control on the Lombard governor, operated from the board, places the main water wheels under control from the board. All parts of the plant are, therefore, under direct control of the attendant at the small 8-foot switchboard, and any operation may be performed almost within arm's reach.

Inasmuch as both generators are of the same capacity as the bank of transformers which it supplies, there is no necessity of interchanging the generators, and bus-bars are not required. Each generator is provided with two main switches, one of which connects it with its own bank of transformers and the other connects it with a spare bank during changes or repairs.

The three ammeters on each generator panel are of the vertical edgewise type, and any unbalancing of any one phase throws that pointer out of the line and makes it more conspicuous. The generator panels contain the usual equipment of line ammeters, field ammeter, switch indicating wattmeter, Lombard governor control button, and pilot switches to control main switches. The integrating wattmeters are not placed on the board, not being necessary for operation. All switchboard instruments are finished in black and polished copper. The exciter panels are of standard pattern, and are equipped with Weston instruments.

From the generator house a passageway carries the leads to the transformer house, which contains nine transformers, each of 400-kw. capacity, 60 cycles, 2,300 to 45,000 volts, of the oil insulated, water cooled type. These are built by the Stanley Electric Company, of Pittsfield, Mass.

The transformer house is of stone, 70 feet long and 12 feet wide on the inside. It is divided into three fireproof compartments, each containing one bank of three transformers, which are all placed in a single row. A path 4 feet wide is left the entire length of the house for the attendant; the oil and water taps, oil gauge and water overflow and thermometer are placed along one side of this path, so that observations can readily be made. A concrete pit runs the entire length of the building below the transformers, and in this are carried the oil and water pipes. A large tile opens from this pit below each transformer to drain burning oil in case of fire.

The high tension leads leave the building through large tiles and are supplied with glass tubes supported by the wire. The glass tubes extend several inches beyond each end of the tiles. There are no high tension switches in the transformer house. A pilot switch, however, is provided for each bank, so that in case of fire or accident the bank may instantly be cleared on both the high and low tension side. The electrically operated switches adapt themselves to this arrangement without adding any complications. Each transformer is mounted on a car resting on a truck by which it can be run into the shop for repairs.

At the same time that it is ideal to have all parts of a generating plant in sight at all times, experience has proven that this may result in the loss of the entire plant. The rapidity with which burning oil spreads and its intense heat, combined with the fact that water merely spreads it, makes it almost uncontrollable when once started. Being "between the devil and the deep sea," it was decided to first reduce the risk of fire and then make everything as convenient as possible under the circumstances. To this end a separate high tension switching and lightning arrester house was designed. This building is constructed of stone and concrete, 40 feet by 30 feet wide. It is divided into 8 compartments by concrete walls rising to such a height from the ground as to leave room for the two sets of busbars connected to the high tension lines.

In 6 of these compartments are placed the 6 triple pole, 45,000-volt oil switches. Each of these switches is provided with a disconnecting switch to clear the oil switch from the line during repairs. There are no single pole switches used on the high or low tension lines. This helps to prevent the unbalancing of the lines, and as one bank of transformers is held in reserve there will be no need of using two transformers in delta connection at any time.

The end compartments carry two sets of lightning arresters (one set for each transmission line) with their disconnecting switches, and from here the lines go out to Seattle. Fig 3 shows a complete diagram of connections and wiring at the generating station.

The oil is fed to the transformers by gravity from a tank in the oil

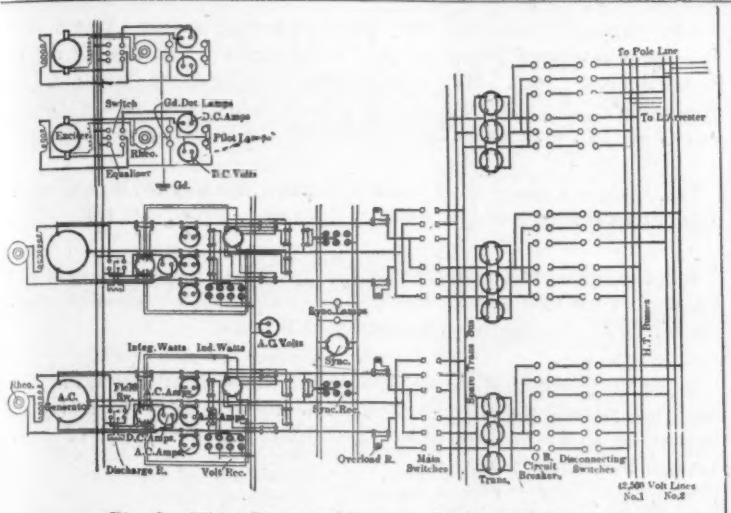


Fig. 3.—Wiring Diagram of Generator Station Main Circuits.

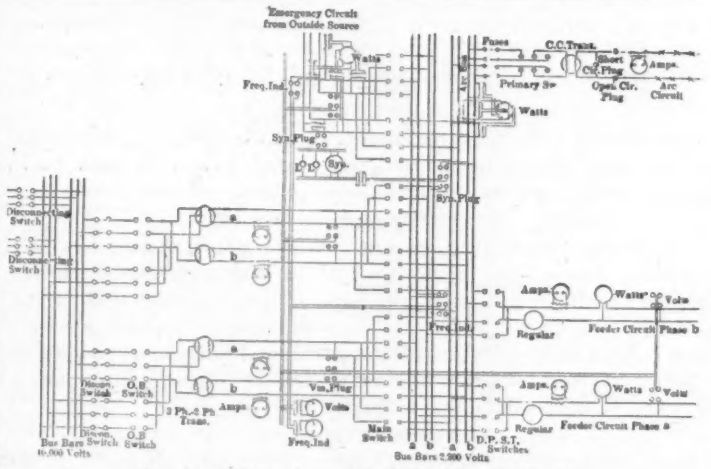


Fig. 4.—Wiring Diagram of Sub-Station Main Circuits.

house, situated on a hill nearby. The oil can be returned if necessary through the same pipe by means of a by pass and pump.

The lines will be built of cedar poles, 35 to 40 feet in length, spaced approximately 140 feet apart. There will be two lines, each carrying one circuit consisting of three No. 2 B. & S. medium hard drawn copper wires spaced 72 inches between centers in the form of the usual triangle.

As no railway work is contemplated, the two lines will probably be operated in multiple and be so arranged that either one can be quickly disconnected should a short circuit or ground occur on the line. Much of the country through which the lines pass is covered with fir trees up to 250 feet in height and damage caused by falling branches will probably make this plan an advisable one. The entire plant, however, is in duplicate and can, therefore, carry separate lighting and motor loads.

One of the lines carries a telephone line of two No. 11 B. & S. hard drawn copper wires on a 5-foot cross arm 5 feet below the cross arms of the power circuit. The transmission lines will be transposed in opposite direction every 2½ miles, and the telephone line at shorter intervals. The wire for the lines and interior work has been furnished by the Standard Underground Cable Company, of New York.

The insulators for the greater part of the system are supplied by the California Electric Company, of San Francisco. They are of the 3-part porcelain type, weighing 11½ pounds each. They are 10 inches in diameter and 11 inches high over all.

The sub-station (corner Yesler and 7th avenue) will be a fireproof structure of brick and stone. The high tension wires will enter on the side of the building and the oil switches, all triple pole, will be in separate compartments. The transformers are of 600-kw. capacity each, in banks of two, changing from 3-phase to 2-phase at 2,200 volts for distribution. Concrete barriers separate the transformers and a pit with tile drains is arranged below them as in the case of the generating station. A car truck for moving the transformers is also supplied. The transformers are of the water-cooled type, the cooling water being supplied from the city water mains.

The sub-station switchboard, like that in the generating station, is a 125-volt board. The 2,200-volt switches and regulators are placed immediately below the board and are controlled by handles and hand wheels at the board. Only plain 125-volt wiring is on the board, and the panels are polished on the back as well as on the front. From the switches the circuits are run to the "tub" transformers for series arc street lighting and to the overhead and underground systems for other purposes. Fig. 4 shows a complete diagram of connections for the sub-station.

The switchboard is of Vermont marble. One panel is provided for each bank of transformers and carries an ammeter for each phase, a voltmeter receptacle, two levers for operating the 4-pole oil switches connecting to either of two sets of busbars, and two levers operating the two triple pole, high tension oil switches to throw the transformers on either line. As there are no double throw switches throughout the plant, the load can be transferred without dropping it during transfer.

A somewhat similar panel is provided to tie in with another station in case of line trouble or a shut down of the plant. This arrangement provides for a transfer to or from the sub-station of 2,000-horse power at 2,200 volts. This panel carries, besides the voltmeter, ammeters and oil switch levers, a frequency indicator, which may be connected to either system.

The distributing panels are single phase, every alternate one being of the same phase. Each carries an ammeter and voltmeter receptacle together with 2 double pole oil switches with overload relays by which the load may be transferred from one set of bus-bars to another of the same phase on the other side. Wattmeters are supplied for all of the panels, but are not placed on the board. Emergency switches are provided for on poles near the building by which the entire load may be cut off the building at the receiving station in case of fire or accident.

The entire design and construction of the plant are under the supervision of Mr. R. H. Thomson, the city engineer of Seattle, who has also constructed for the city its present water works system, one of the most successful in the West.

The designing and planning of the electrical work of the plant have been done by Mr. J. D. Ross, electrical engineer of the city, who is in charge of this part of the work.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE proprietors of the Meriden (Conn.) Gas Light Company are arranging for a main extension to South Meriden.

MR. JOHN C. DODS is no longer with the Laclede Firebrick Manufacturing Company, of St. Louis, Mo. He has accepted the position of Chief Engineer to the Edgar Zinc Company, of Cherryvale, Kas. His relations with the Edgar concern are not altogether new. Good luck to him.

A CORRESPONDENT in St. Joseph, Mo., writing under date of Feb. 26th, incloses the following: "The St. Joseph Gas Company moved into its new office building to-day and hereafter all business will be transacted in the handsome structure at the southeast corner Eighth and Francis streets, which has been erected and equipped at a cost of $50,000. The new home of the Gas Company is built of buff brick with stone trimmings, two stories and basement, arranged throughout for the convenient transaction of business. The new building has a frontage of 78 feet on Francis street and 55 on Eighth, with the lower story frontage made up almost exclusively of heavy plate glass. The upper story also is perfectly lighted. Inside, the structure has been planned throughout for the convenience of office men. New desks of polished oak extend about the fronts of the office, while a wide corridor, with tile floor, extending from desks to street entrances permits of a display of such gas goods as the Company deals in. Aside from the long counter desk there have been provided new secretarys for each of the 15 office employes and the office of General Manager K. M. Mitchell, in the northeast corner of the main office, is a model of convenience. Secretary Ferd Labrunerie will occupy a desk in the extreme southwest corner of the building. The upper story is occupied by a director's room and an assembly or lecture room which will be in charge of a demonstrator who will give instructions in cookery and kindred subjects. The room will be provided with easy chairs and will accommodate an audience of 300. In the basement are store rooms, work rooms and the steam heating plant of the Company, and on this and the first floor are very large and convenient fireproof vaults. An annex on the east, 35 by 55 feet in dimensions, is conveniently arranged for the unloading and storage of supplies. An ingenious device near the Eighth street entrance consists of long polished oak seats covered with costly cushions, where patrons may rest and cool off before entrance into an

adjoining small office, known as the complaint desk, or kicker's retreat. Probably there is no more conveniently arranged and equipped gas office in any city than that which the St. Joseph Company now occupies."

THE Sterling (Ills.) Gas and Electric Light Company proposes to perfect its main system in the outlying district known as Rock Falls. Main extensions are reported from many places.

THE General Gas Light Company, of Kalamazoo, Mich., has been granted a decree, with costs, against the Matchless Manufacturing Company for infringement of the former's design patent (No. 35,481) on the Humphrey gas arc lamp. The decree, handed down by the U. S. Circuit Court for the Southern District of New York, orders that an injunction be issued restraining the Matchless Company from manufacturing or selling the lamps in question.

MR. CARROLL MILLER has been appointed General Manager of the Osaka Gas Company, Limited, of Osaka, Japan.

A CORRESPONDENT in Wilmington, Del., forwards the following: "The property of the New Castle (Del.) Gas Company was sold at Receiver's sale the morning of February 27th in the Federal Building, this city, by order of Mr. Robert Pennington, the Receiver. The auctioneer was Mr. W. A. Hupill. Mr. William T. Lynam, attorney, purchased the plant for the sum of $10,000, but refused to give the name of the purchaser, whom he represented. It was reported that he made the purchase for the Wilmington Gas and Electric Company, but Mr. Edmund Mitchell, Jr., Vice-President of that Company, denied that Mr. Lyman represented his Company. He said that Mr. William S. Hilles was his Company's attorney. Mr. Hilles was not present when the property was sold. Mr. David J. Reinburdt, said to be representing Mr. John E. Taylor, of New Castle, bid on the property up to $9,900, but refused to go above $10,000. The first bid was for $6,000.

THE output on gas account by the Cincinnati Gas and Electric Company for last month exceeded that for the corresponding month of 1903 by 22,000,000 cubic feet.

OWING to the resignation of Mr. H. C. Whitney as Manager of the Watertown (N. Y.) Gas Company, which resignation was handed in last January, the Story estate interest in the Company was sold to Mr. John B. Taylor who, with Messrs. A. R. Flower, A. C. Beach, George N. Babcock, O. F. Hungerford and others now control its affairs. Mr. C. F. Coffin, formerly in charge of the affairs of the Mohawk Gas Company, Schenectady, N. Y., has been appointed Manager, and it has been determined to construct a modern gas plant on a plot recently purchased at the intersection of Engine and Newell streets. The expenditure on construction account (works and mains) is put at $150,000, and it is thought the plant will be in operation by December 1st.

DELEGATE BOSSE, of the Maryland Legislature, has introduced a bill which proposes that those who desire to construct gas or electric plants in the cities of that State must first secure the consent of the local authorities for such construction.

THE New York and Richmond Gas Company, of Staten Island, New York, has declared an initial dividend of 1 per cent. on its common stock. Good for Messrs. Shelton and Horton.

AT the annual meeting of the New Orleans (La.) Gas Light Company the officers elected were: Directors, A. H. Sieverd, R. M. O'Brien, D. M, Kilpatrick, Alden McLellan, A. B. Wheeler, Jno. Stumpf and E. C. Foster; President, A. H. Sieverd; Vice-President, E. C. Foster; Treasurer, F. E Richmond; Secretary, Duncan Jones.

MR. R. F. FUERTADO, General Manager of the Western Gas and Investment Company, of Chicago, which concern recently secured control of the Stillwater (Minn.) Gas and Electric Light Company is planning important extensions to the named properties. In fact, it is our understanding that a complete new gas plant is to be constructed, with the intention of having it in actual duty by November 1st.

THE authorities of Sea Cliff, L. I., have granted the proprietors of the Sea Cliff and Glen Cove Gas Company the right to construct and operate a gas plant in that village. One of the stipulations in the franchise is that the Company shall make no charge for gas used in the Fire House and the Village Hall.

MR. JOHN HARRIES, for many years a Director in the Dayton (O.) Gas Light and Coke Company, died at his home in that city the morning of February 24th. He was in his 90th year, having been born in South Wales, January 29, 1815. He had been a resident of Dayton since July 5th, 1829, to which place his parents had emigrated.

THE Hudson County (N. J.) Gas Company has applied to the New York Stock Exchange to list $570,000 5 per cent. bonds, due 1949.

THE Cincinnati Gas and Electric Company has contracted with the Kanawha Coal Company to furnish it with 20,000,000 bushels of coal, the deliveries of same to cover a period of 5 years.

A SPECIAL meeting of the shareholders in the Detroit City Gas Company will be held the 21st inst. to consider the execution of a mortgage amounting to $10,000,000. The Equitable Trust Company, of New York, is the named Trustee.

THE Selectmen of Warren, Mass., have refused the petition of the Worcester County Gas Company to lay mains for the distribution of gas in Warren.

THE proprietors of the Eau Claire (Wis.) Gas Light Company are seeking to have their charter amended so that they may engage in the supply of electric currents.

MESSRS. W. A. MOODY, L. T. Underhill and Chas. Perry are proposing to establish a gas works in Knoxville, Ia.

MR. H. L. RICE, formerly General Manager of the City Gas Company, of Norfolk, Va., has been appointed General Manager of the Macon (Ga.) Light and Water Company, succeeding Mr. O. M. Diall, who has accepted a responsible berth with the Lockport (N. Y.) Gas and Electric Company.

MR. GEORGE R. BROWN, who served the Morristown (N. J.) Gas Company capably as Superintendent for something over 11 years, has accepted the place of Manager in the gas division of the properties of the Tacoma (Wash.) Gas and Electric Light Company.

MR. CHARLES E. LAWRENCE has been elected President of the Charlestown (Mass.) Gas and Electric Company, vice Mr. J. P. Hunnewell, resigned.

THE people of Honolulu are anxious for a gas supply, and it is likely their wishes in that respect will soon be satisfied.

THE Columbus (O.) Gas Company has declared a dividend of 4 per cent. on its common stock.

THIS is from the Washington (D. C.) *Star*, dated the 25th February: "Representative S. W. Smith of the judiciary sub-committee of the House committee on the District of Columbia to-day introduced a bill authorizing and directing the Attorney-General of the United States to institute a suit or proceedings in the Supreme Court of the District of Columbia by application for a writ of quo warranto against the Washington Gas Light Company for the purpose of having determined and adjudged the legality of the act or acts of said Company in issuing $2,600,000 of certificates of indebtedness of said Company and delivering them to its stockholders as a gratuity. The preamble of the bill recites that during the Fifty-seventh Congress the Washington Gas Light Company endeavored to secure legislation authorizing it to purchase the Georgetown Gas Light Company and issue increased capital stock. This bill and its substitute proposed by the Commissioners both failed. Continuing, the preamble states that subsequent to the adjournment of the Fifty-seventh Congress the Washington Gas Light Company issued $2,600,000 worth of certificates bearing 6 per cent. interest, and presented them to its stockholders as a gratuity. By doing this it is claimed the Company has established ground for the legal proceeding now proposed, because, it is alleged, the act of issuing the certificates is not authorized by the charter of the Company nor the laws of the District of Columbia. It is stated, further, that such unwarranted acts affect the welfare of the District of Columbia, and, therefore, the proceeding is authorized and directed. The bill confers jurisdiction upon the Supreme Court of the District of Columbia to enter judgment and declare whether or not the issuance of the certificates was authorized by law or whether such issuance was in excess of the exercise of the rights, privileges and franchises of the Company."

THE AMERICAN GAS LIGHT JOURNAL

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OHIO GAS LIGHT ASSOCIATION.

NOTIFICATION RESPECTING ADVERTISING.
Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:
New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, MARCH 7, 1904.

The Market for Gas Securities.

The market for city gas shares was quite animated during the week, and Consolidated showed a marked gain despite the attacks that are being made upon it at home and in Albany. The closing prices to-day (Friday) were 193 to 194, a clear gain of 4 points in the bid price for the week. There was some inquiry for Standards, but no sales were reported, the views of the possible traders being too far apart.

Brooklyn Union is dull, and whatever change has occurred in it since last week has been for the better. The proposed large increase in the Laclede Company's indebtedness has had a very bad effect on the preferred stock, which is 75 bid, 90 asked. Peoples, of Chicago, is holding right to the mark. Baltimore Consolidated is 58 to 60, which is a right good record considering the Company's recent fiery experience. Washington (D. C.) is down a bit from the high point of last week, although it is pretty well accepted by good financiers that the proposed measures now in Congress for overhauling the Company will not become law.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

MARCH 7.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	193	194
Central Union, Bonds, 5's	3,000,000	1,000	104	105
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Metropolitan	658,000	..	108	112
Mutual	3,500,000	100	260	290
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co. ..				
Bonds, 5's	11,000,000	1,000	103	105
Northern Union, Bonds, 5's.	1,250,000	1,000	105	106½
New York and East River ..				
Bonds 1st 5's	3,500,000	1,000	102	106
" 1st Con. 5's	1,500,000	..	109	111
Standard	5,000,000	100	125	135
Preferred	5,000,000	100	145	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	116	117
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	185	190
" " Bonds (5's)	15 000,000	1,000	113	115
Bay State	50,000,000	50	3/16	¼
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	4⅝	4¾
" " Bonds, 5's	5,250,000	1,000	65	69
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas and Electric Co.	29,500,000	100	97¾	98
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	101	101½
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	88¼	89½
Preferred	3,026,500	100	107½	109
Consumers, Jersey City Bonds	600,000	1,000	100	102
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore	11,000,000	100	58	60
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	86	90
Consolidated G. & E. Co.'s.				
Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	..	50
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	581,000	1,000	75	75¼
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	245	265
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	55	65
" Bonds, 6's	2,650,000	..	103½	106½
Jackson Gas Co	250,000	50	73	75
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	79	90
Preferred	2,500,000	100	75	95
Bonds	10,000,000	1,000	109½	110
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	138	140
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	107½	108½
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	184¾
Nashville Gas Lt. Co	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	105	105¾
New Haven	1,000,000	25	64	70
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	98¼	98½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	.
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	15,800,000	100	..	55
St. Joseph Gas Co.				
" 1st Mtg. 5's	751,000	1,000	92	96½
St. Paul Gas Light Co	1,500,000	100	4	4
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	92	93
Syracuse, N. Y.	1,975,000	100	46	48
Bonds	2,047.000	1,000	94	96
Washington, D. C	2,600,000	20	274⅜	275⅝
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	.	..	..
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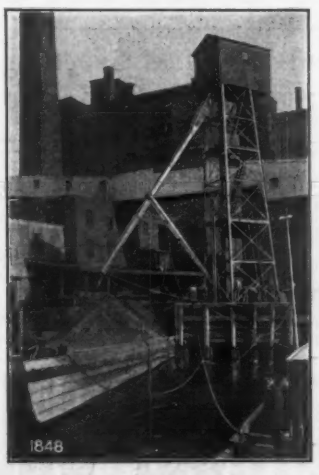

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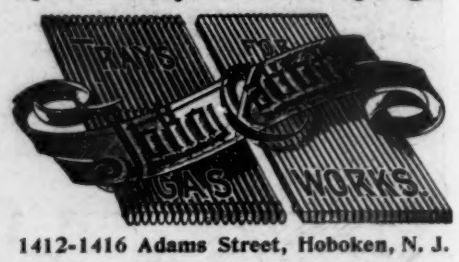

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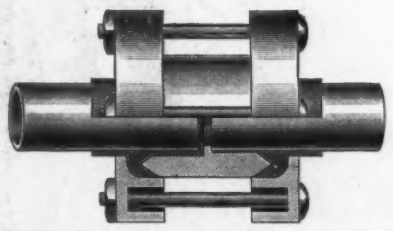

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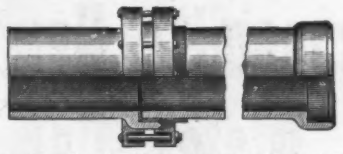

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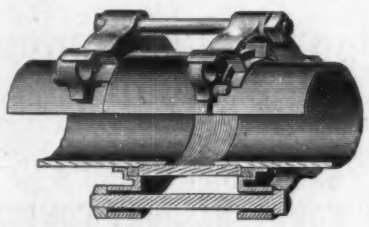

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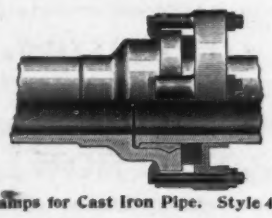

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Pipe Couplings, Sleeves, Clamps, Crosses, Tees and Ells.

My Insulating Coupling prevents the destruction of pipe by electrolytic action, in either water or gas lines.

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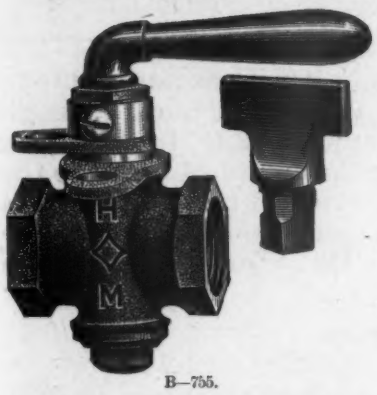

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Made in 145 styles, seven sizes in each style.

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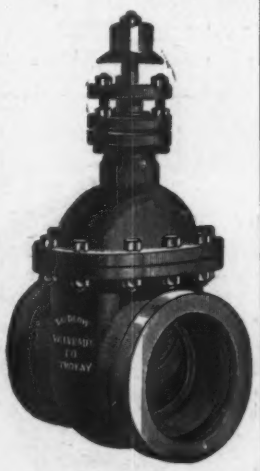

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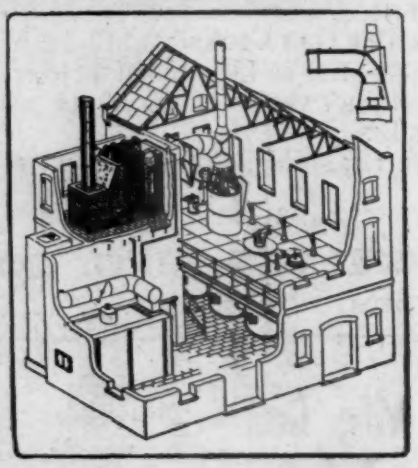

To absorb the heat now going to waste when you blow through your superheater to heat the feed water for your boilers to the temperature of the steam. This is now being done at the Poughkeepsie Gas Works, Poughkeepsie, N. Y. : : : : :

Write for full particulars how this is accomplished, the saving effected, and the advantages gained, to the

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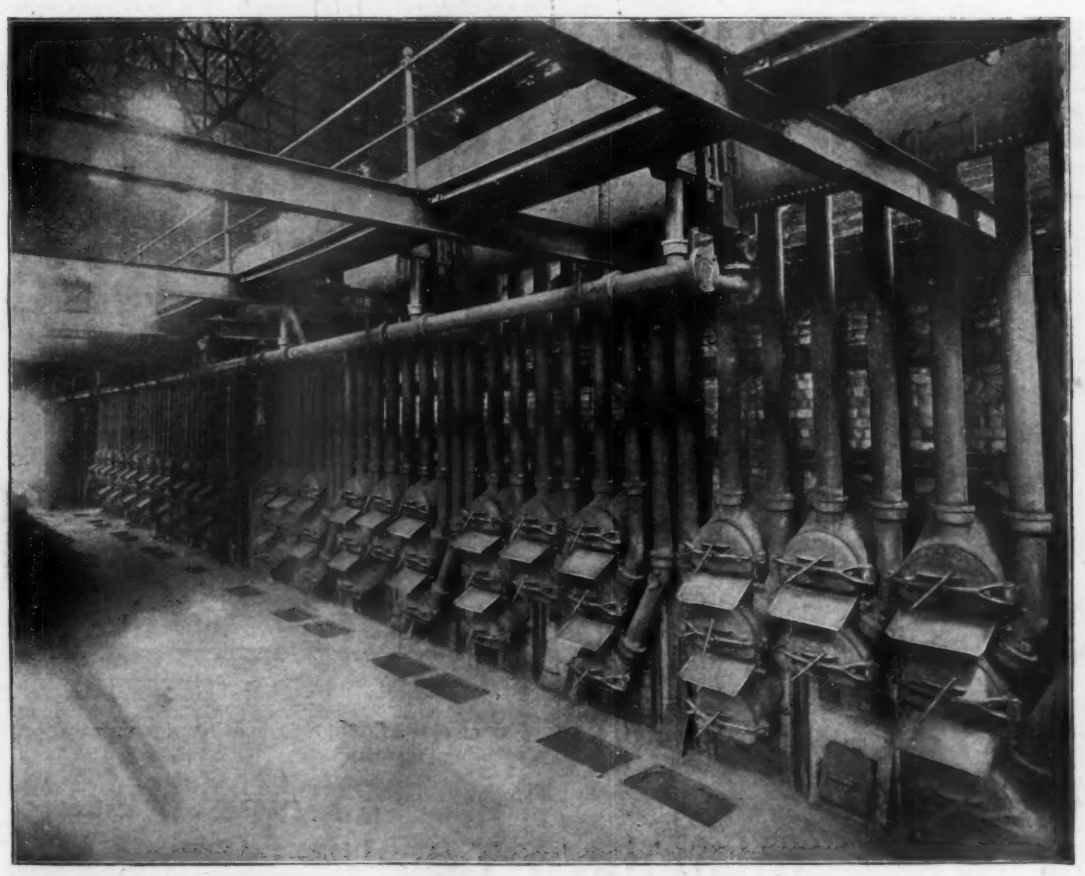

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GAS TAPPING MACHINES
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Drilling and Tapping Pipe under Pressure
WITHOUT ANY ESCAPE OF GAS.
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Size of Combination Drills and Taps ¾ to 4-inch.
Machines Sent to any Gas Company for Thirty Days' Trial.
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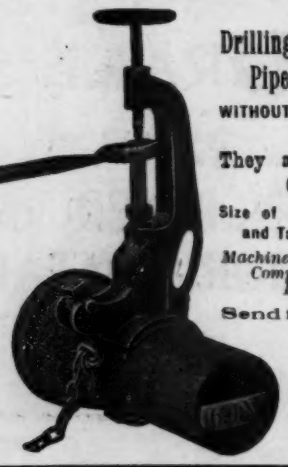

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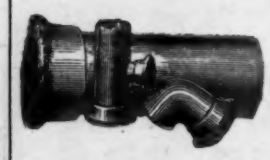

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FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF
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FOR GAS.
With our experience, ability and facilities we produce
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WATER HEATERS.
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For general use and long continued satisfaction, we recommend this No. 2 Heater, the handsomest ever made.
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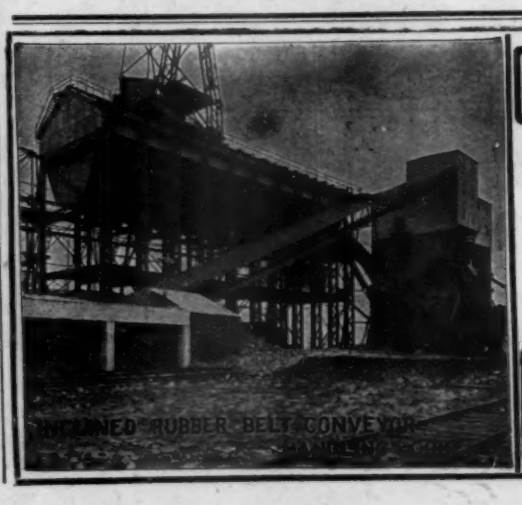

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BALL BEARING ROLLS
ARE THE BEST,
because they possess greater efficiency, consume less power, and the belts last longer than when any other type of roll is employed.
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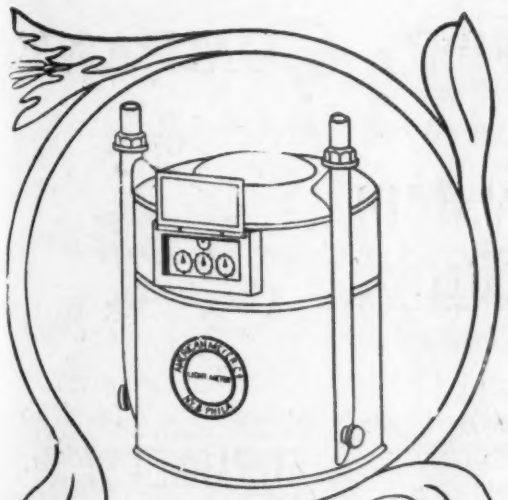
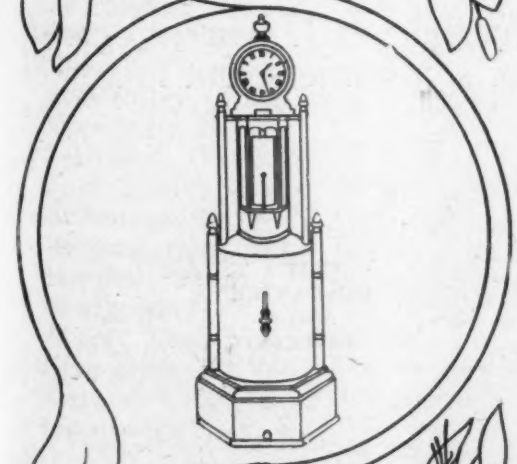




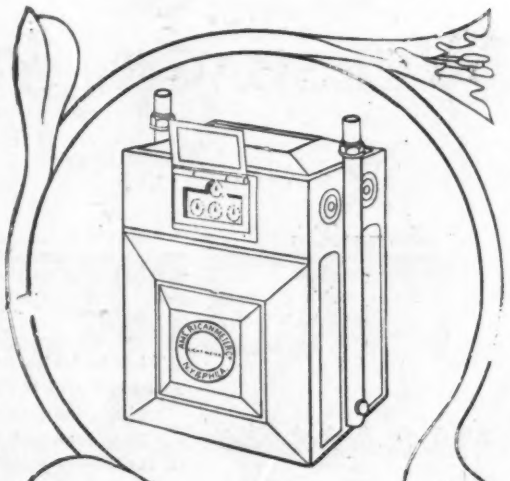
PUBLIC LIGHTING TABLE.

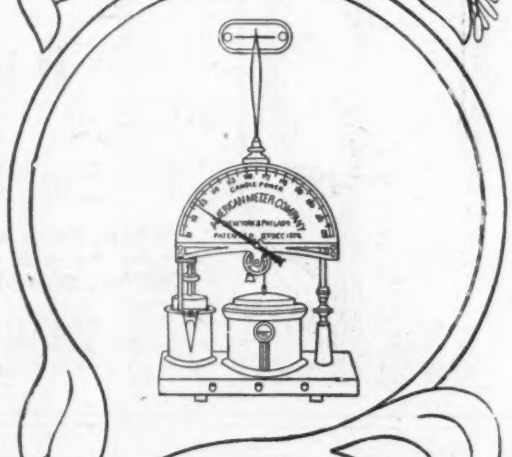
MARCH, 1904.

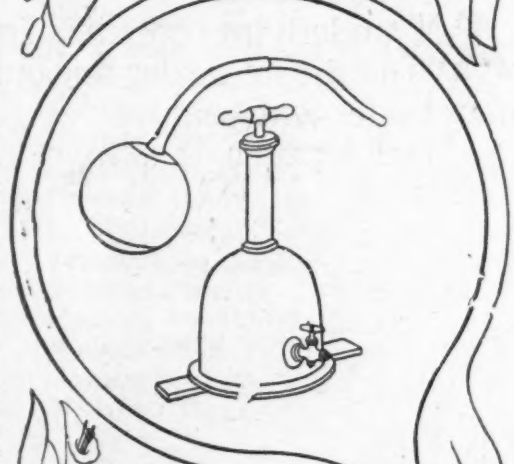
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Tue.	1	No L. FM	No L.	5.30	5.45
Wed.	2	No L.	No L.	5.30	5.45
Thu.	3	6.20 PM	9.00 PM	5.30	5.45
Fri.	4	6.20	10.10	5.30	5.45
Sat.	5	6.20	11.20	5.40	5.35
Sun.	6	6.30	12.20 AM	5.40	5.35
Mon.	7	6.30	1.20	5.40	5.35
Tue.	8	6.30 LQ	2.20	5.40	5.35
Wed.	9	6.30	3.10	5.40	5.35
Thu.	10	6.30	3.50	5.40	5.35
Fri.	11	6.30	4.30	5.40	5.35
Sat.	12	6.30	5.10	5.50	5.20
Sun.	13	6.40	5.10	5.50	5.20
Mon.	14	6.40	5.10	5.50	5.20
Tue.	15	6.40	5.10	5.50	5.20
Wed.	16	6.40 NM	5.10	5.50	5.20
Thu.	17	6.40	5.10	5.50	5.20
Fri	18	6.40	5.10	5.50	5.20
Sat.	19	6.40	5.10	6.00	5.10
Sun	20	6.40	5.00	6.00	5.10
Mon.	21	9.40	5.00	6.00	5.10
Tue.	22	10.40	5.00	6.00	5.10
Wed.	23	11.40	5.00	6.00	5.10
Thu.	24	12.30 AM FQ	5.00	6.00	5.10
Fri.	25	1.20	5.00	6.00	5.10
Sat.	26	2.10	5.00	6.10	4.55
Sun.	27	2.50	4.50	6.10	4.55
Mon.	28	3.40	4.50	6.10	4.55
Tue.	29	No L.	No L.	6.10	4.55
Wed.	30	No L. FM	No L.	6.10	4.55
Thu.	31	No L.	No L.	6.10	4.55

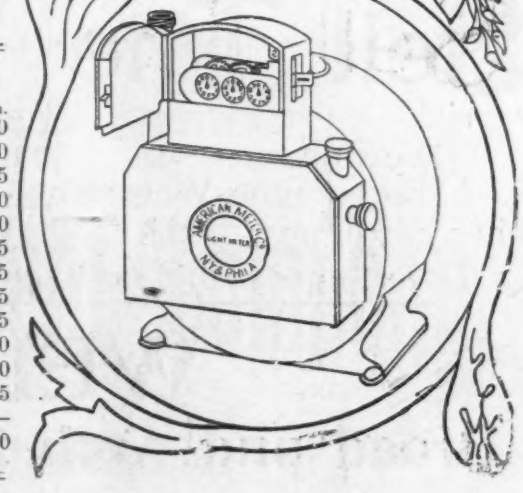
TOTAL HOURS LIGHTING DURING 1904.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	225.00	January	423.20
February	205.40	February	367.40
March	187.40	March	355.35
April	169.50	April	298.50
May	152.30	May	264.50
June	137.20	June	234.25
July	138.50	July	243.45
August	151.00	August	280.25
September	164.40	September	321.15
October	191.30	October	374.30
November	210.30	November	401.40
December	237.10	December	433.45
Total, yr	2171.40	Total, yr	4000.00





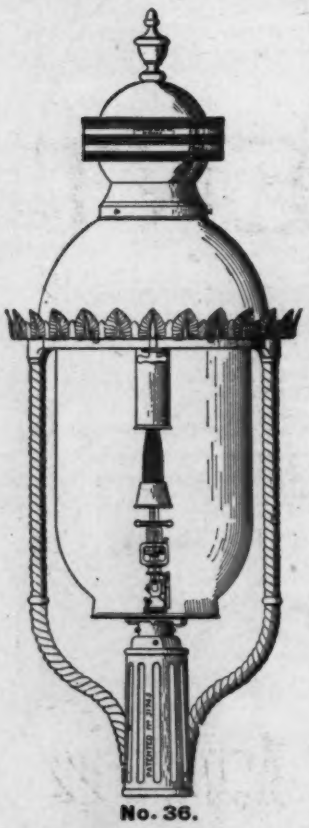




NEW YORK, 33 Nassau Street. BOSTON, 814 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, Foot of Orleans Street. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



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Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

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Sell The Welsbach Brands.

The imitation stuff is bad for the customer---which is bad for you.

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And your profit isn't merely dollars and cents.

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Hagerstown, Md.
Malden, Mass.
Bridgeport, Conn.
Albert Lea, Minn.
Brooklyn, N. Y.
Kansas City, Kas.
Hempstead, N. Y.
Chester, Pa.
Lynn, Mass.
Newark, N. J.
Washington, D. C.
Boone, Ia.
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Charlotte, N. C.
Fall River, Mass.
Duluth, Minn.
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Waltham, Mass.
Dover, Del.
York, Pa.
Minneapolis, Minn.
Allentown, Pa.
Savannah, Ga.
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Cicero, Ills.
Chicago (Ogden Co.)
Easton, Pa.
Lawrence, Mass.
Council Bluffs, Ia.
Chattanooga, Tenn.
Tuckerton, N. J.
Springfield, O.
Easton, Pa. (2d contract).
Mobile, Ala.
Conshohocken, Pa.
Mason City, Ia.

TOTAL SETS FOR 1903, ... 62
TOTAL DAILY CAPACITY, ... 62,950,000 cubic feet.
TOTAL SETS TO DATE, ... 508
TOTAL DAILY CAPACITY, ... 362,780,000 cubic feet.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
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Estimates Furnished on Application for Most Successful Style of Construction.

Also for Free-Firing and Full and Half-Depth Regenerative Benches, for Burning either Coal or Coke in the Furnaces.

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Manufacturers of the very best quality of Clay Retorts, Blocks, Tiles, Settings and Firebrick of every description.

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CONSOLIDATED GAS CO. OF NEW JERSEY, LONG BRANCH, N. J.,
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As far as we can see at the present time, it will only be necessary for us to put in new retorts in resetting these benches, as the furnace blocks and recuperative flues are in very good condition.

Yours very truly,
(Signed) W. B. TUTTLE,
General Manager.

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FIRE BRICK, FIRE CLAY,
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Our Improved Half and Full Depth Benches have been Adopted by Many Gas Companies.

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Bronder Patent Stoking Machinery.

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Four-Scoop and Four-Rake Charging and Discharging Machines are being furnished for Detroit, Mich.

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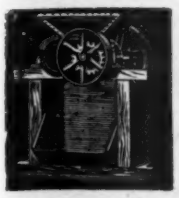

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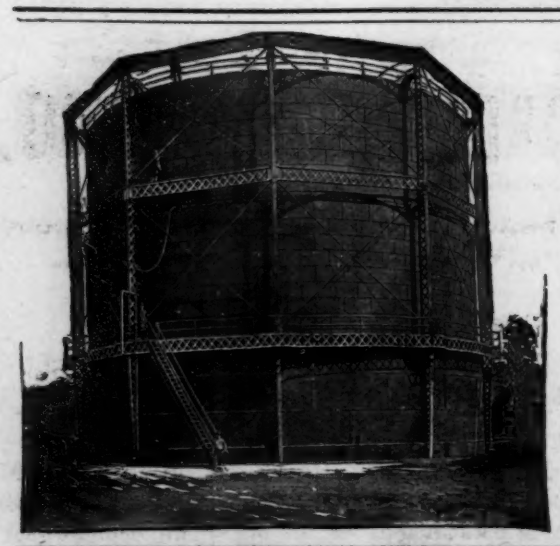

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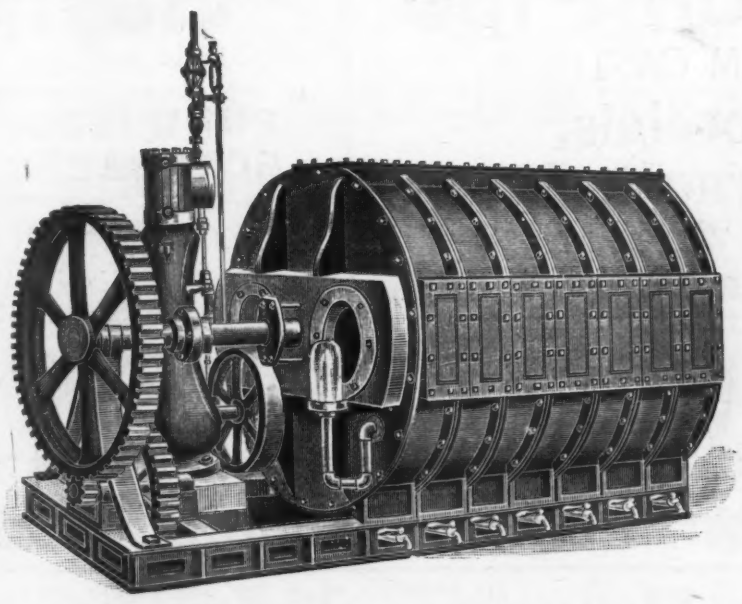

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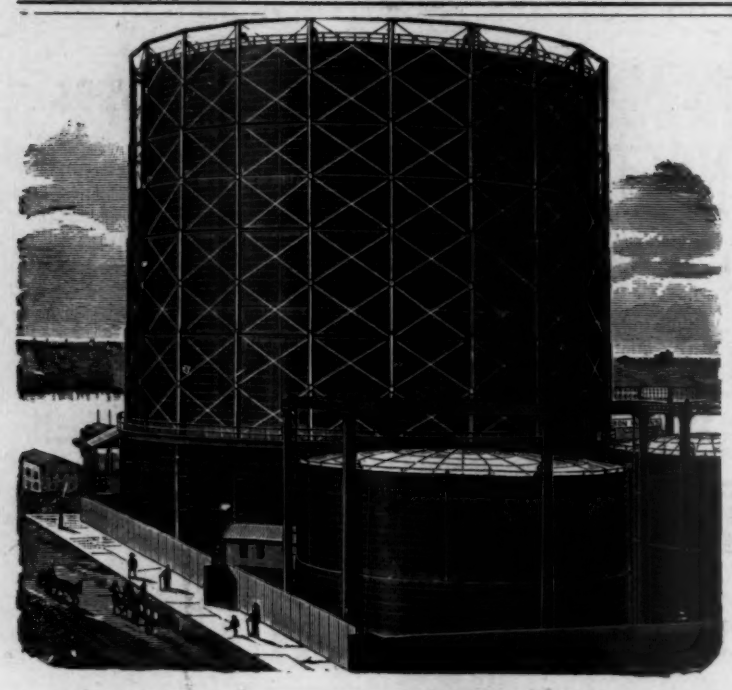

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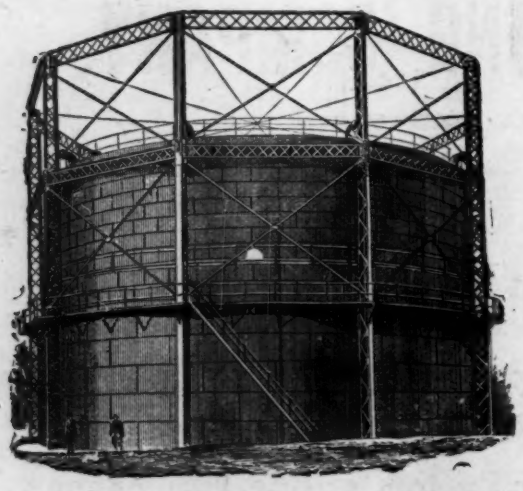

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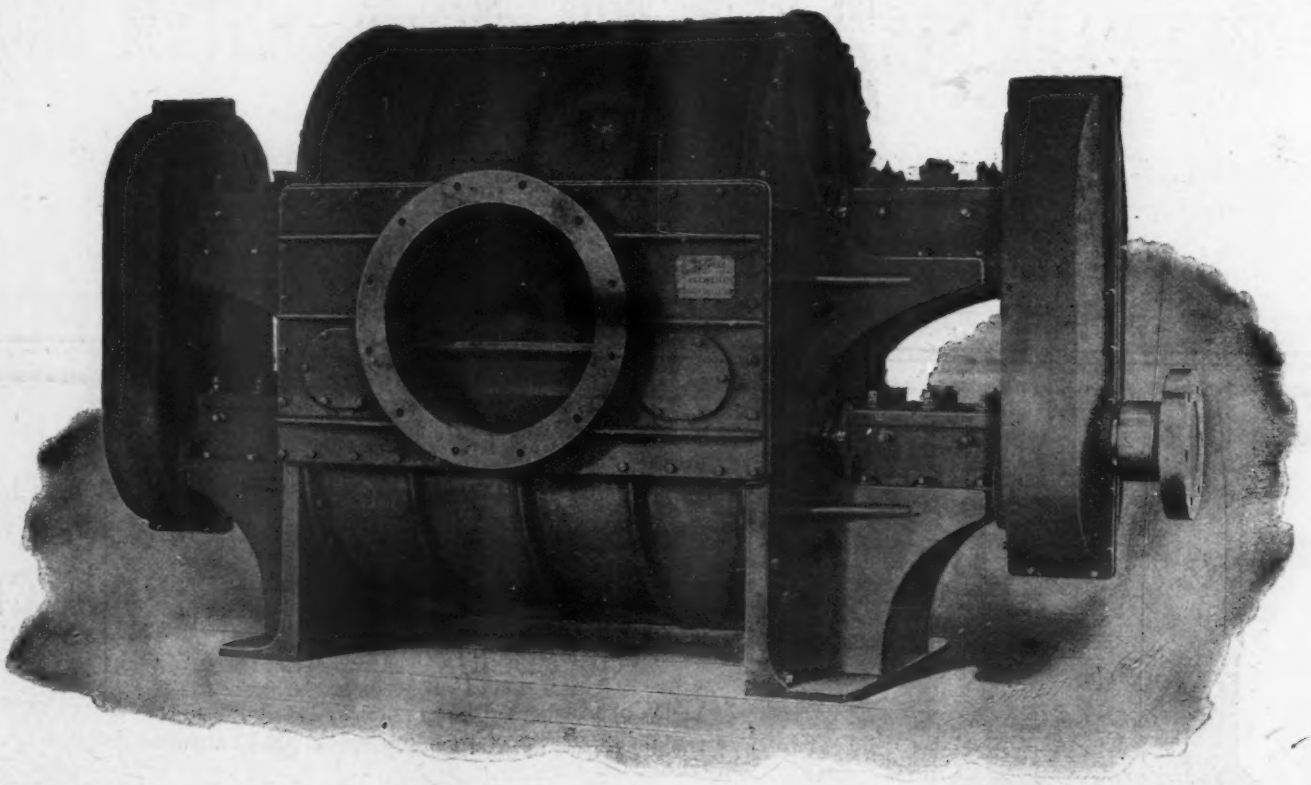

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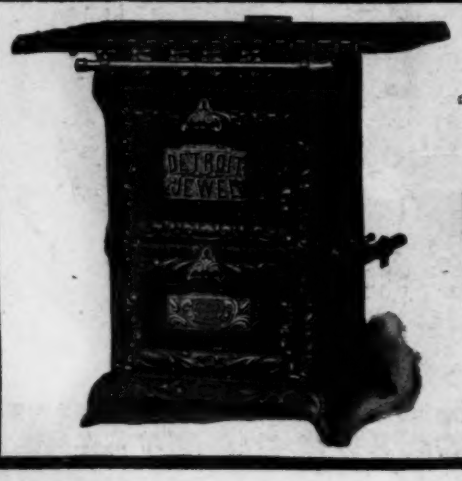

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